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THE JOURNAL

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PRICE, 3D.

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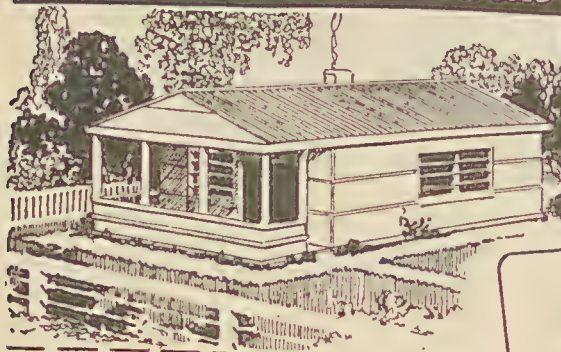
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Association Herd Test

REPORT FOR YEAR 1946-47.



By W. J. YUILL - Supervisor of Herd Testing

THE 79,303 cows in the Association Herd Test this year averaged 5,411 lb. milk and 264 lb. butterfat. Favourable seasonal conditions throughout the State contributed to the high yields.

Altogether, 87,426 cows were under test, but, owing to difficulty in obtaining herd testers, figures from several Associations were still outstanding when this report was written.

While it is satisfactory to note the increase in the number of cows under test, it is far from satisfactory to note the slow increase in the average yield per cow in Victoria. An extensive survey has been made to assess, if possible, the effect of seasonal influence on herd improvement.

The present average yield per cow can be raised very considerably, but it is open to question whether the system of feeding practised by many stud breeders and on

farms supplying milk to city areas is economic on "butterfat" farms.

The fact that some leading Herd Testing Associations in Victoria have increased the average yield per cow by more than 100 lb. butterfat over the State average yield, indicates the need for a wider application of sound dairy-farming knowledge.

There are large areas of Victoria where a 300-lb. butterfat herd average may never be attained under commercial farming conditions. At the same time, better farming methods, and a sounder breeding programme could produce much better results than are now being obtained.

FREE SIRE SURVEY SERVICE

The Department is prepared to assist any breeder or farmer to prove the inheritance being transmitted by his herd-sire. An application form, on which the conditions



A picture taken during the early days of herd testing in Victoria. Mr. F. Fisher setting out on his round in 1924. Mr. Fisher is now dairy farming at Loch, South Gippsland.

of the Sire Survey Scheme are set out, may be obtained from the Superintendent of Dairying. There is no charge for this service, other than the initial cost of herd-testing fees. These, of course, are unavoidable, for a Sire Survey can be made only where the test yields of the mates and daughters of a bull are available.

THE ONE-TON BUTTERFAT REGISTER

No fewer than 159 "One-ton Butterfat" Certificates have already been issued to testing farmers. Since it takes an average cow about eight seasons to earn a certificate, it is apparent that many of the aged cows now in tested herds missed inclusion in their early life when war conditions put so many testing units out of commission.

More appreciation might well be given to those splendid old matrons of the herd,

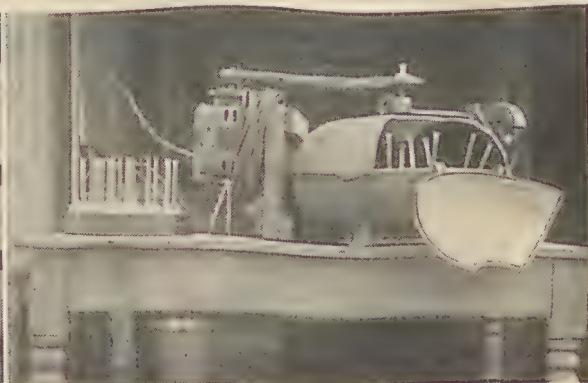
that calve regularly and make many economic yields, rather than to cows with a few spectacular records, or many low ones. These animals are real dairy cows, for not only do they work well, but usually transmit well when mated to a proven sire. Extensive research in New Zealand has focused attention on this kind of cow as the most likely source of securing sound herd replacement, or obtaining a herd-sire, when the cow is a registered pure-bred one. Herd-testing farmers are advised to enquire through their Association Secretary, for full particulars of this certificate.

POWER-DRIVEN CENTRIFUGES FOR HERD TESTERS

For many years, there has been a testing room at the Terang butter factory set apart for the herd tester, where a power-driven centrifuge is available. The steam also supplies a good service for water heating to cleanse the milk sample bottles.

At Dumbalk North, a $\frac{1}{4}$ -h.p. electric motor for the same purpose has been in use for many years. On 22 farms, the herd tester has power available to run his centrifuge. The recently reformed Dumbalk Association also has introduced a power unit for its herd tester. The cost of the unit is approximately £10. Hand machines can be quite easily converted to power.

The herd tester at Dumbalk North, speaks enthusiastically of the service. He reports that, while his first set of samples are being



The power-driven centrifuge saves this Dumbalk North herd-tester a great deal of time. Right: A near view of the apparatus.

centrifuged, he can be pipetting a second set. This reduces the time needed for the testing work.

The matter is referred to here as one means of giving more appeal to the tester's work, which is still the most difficult phase of the ever-expanding work of the herd recording movement. Arrangements for adding the pulley-drive to an ordinary centrifuge could be made during the slack time of the season.



One of the leading cows in this year's test, Mr. F. W. Hawten's "Nigger," (Korumburra Association) produced 720 lb. butterfat.

HERDS OF LESS THAN 20 COWS.

Owner.	Association.	Cows.	Butterfat.
W. Matthews ..	Leongatha No. 3	13	lb., 494
Hec. McLean ..	Leongatha No. 1	18	491
O. Fehring ..	Rochester and Echuca East	12	449
H. L. Woodman ..	Rochester and Echuca East	19	432
C. L. Pool ..	Bairnsdale No. 2	10	431
R. J. Wells ..	North Murchison	17	424
R. S. Paterson ..	Dumbalk North No. 1	19	410
M. J. Williams ..	Swanpool No. 1	12	401
F. G. Williams ..	Tongala No. 1	15	399
O. W. Bergmann	Traralgon No. 3	12	398
Mrs. F. and Mr. R. Jebson	Toora and Welshpool	15	395
O. C. Nash ..	Rutherglen-Chiltern No. 1	18	393
A. E. Charlton ..	Stormy Creek	17	392
G. W. Shepherd ..	Bairnsdale No. 2	16	391
C. R. Shugg ..	Fish Creek No. 1	11	385
M. J. Elliot ..	Pakenham ..	14	383
R. M. Jacobsen ..	Narracan No. 2	10	382
J. B. French ..	Swan Hill ..	19	373
C. M. Govett ..	Rochester ..	18	371
J. J. Wilson ..	Toora and Welshpool	15	368
L. J. Felmingham	Maffra Sale No. 2	17	366
A. E. Atwell ..	Leongatha No. 3	18	364
E. A. Gay ..	Narracan No. 2	16	361

SEVEN UNITS AVERAGE OVER 300 LB. BUTTERFAT

At present, there are approximately 113 testing units in operation. More would have been organized but for the difficulty of securing suitable testers, transport, and equipment.

Of the 97 units in action during the past season, 37 averaged over 270 lb. butterfat.

At Mountain View, Dumbalk North, Leongatha No. 3, Yinnar, Cohuna No. 1, Swanpool, and Swan Hill, the average yield of all cows exceeded the 300-lb. butterfat level.

Korumburra No. 1 and Korumburra No. 2, also Narracan No. 1 and Gainsborough, were all within a few pounds of the 300-lb. level. The same applies to Stanhope and Tongala No. 1 in the Goulburn Valley. Swanpool No. 1 unit is the first to exceed the 300-lb. level in the North-eastern area. Some units suffered a setback, owing to the late date of the commencement of testing; others had difficulties through the loss of their tester. The general average yield of all tested cows is now higher than that of the best herds during the early years of testing work when the tested cows averaged less than 170 lb. butterfat.

530 HERDS EXCEED 300-LB. BUTTERFAT LEVEL

In the previous record year of Association herd testing, there were less than 500 herds

that exceeded the 300-lb. butterfat level. Since then, war-time conditions, drought, restricted supplies of fertilizer, and labour have had their effect. Some of these disabilities still exist, but normal conditions are returning, for, in 1946-47, a season similar to the one abovementioned, more than 530 herds averaged yields of more than 300 lb. butterfat. Of this number, 172 exceeded the 350-lb. mark, including 29 that produced over 400 lb. butterfat per cow. As usual, there are a few small herds of less than ten cows with exceedingly good average yields. These were excluded from the tables in accordance with the rules of the V.U.C.T.A.

The leading herd for the year is owned by Mr. W. Matthew. This small, select Jersey herd, with its 494-lb. butterfat average, is closely followed by Mr. H. McLean's Jerseys with 491 lb. butterfat. Both herds are in the Leongatha Association.

There are six other herds in the "under-twenty cow" section that exceeded the 400-lb. butterfat average.

Among the 30 herds in the "20- to 39-cow" division, thirteen averaged yields better than 400 lb. butterfat. Several other herds were very close to this average, which is a really excellent yield.

The herd of 21 cows owned by Mr. L. Oliver, of Rochester, heads the list with an average yield of 476 lb. butterfat. Mr. A. Walker, of Yinnar, and Mr. N. H. Pratt, of Mountain View, each own 35-cow herds, which produced over the 470-lb. butterfat level.

Mr. Owen Jones, of Dumbalk North, has a two-year herd average of more than 400 lb. butterfat.

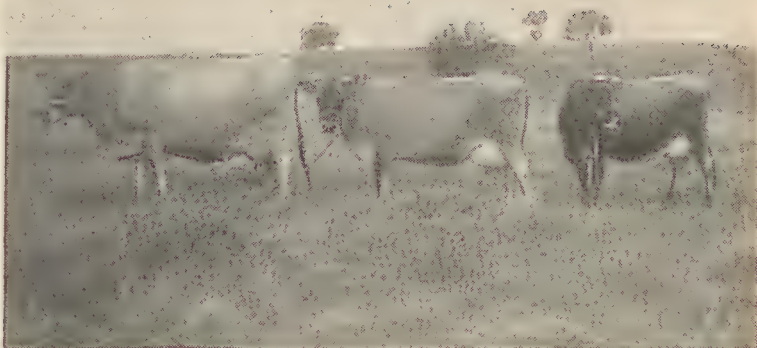
HERDS OF 20 TO 39 COWS.

Owner.	Association.	Cows.	Butterfat.
L. Oliver ..	Rochester ..	21	lb. 476
N. H. Pratt ..	Mountain View No. 1	35	474
A. Walker ..	Yinnar ..	35	471
O. Jones ..	Dumbalk North No. 1	23	426
K. Chisholm ..	Leongatha No. 3	33	424

HERDS OF 20 TO 39 COWS (continued).

Owner.	Association.	Cows.	Butterfat.
F. J. Dinneen ..	Toora and Welshpool	25	422
H. L. Withall ..	Leongatha No. 1	21	422
A. E. Tack ..	Korumburra No. 3	38	420
Ken McLean ..	Leongatha No. 1	27	414
E. A. Sawyer ..	Stanhope No. 1	36	413
Stephens Bros. ..	Korumburra No. 2	39	408
J. A. Warnock ..	Swanpool No. 1	36	408
L. Bunn ..	Korumburra No. 1	36	408
J. S. Thewlis ..	Pakenham ..	25	396
J. Barrow ..	Korumburra No. 3	33	394
R. Seabrook ..	Korumburra No. 4	36	392
E. J. Hicks and Sons	Rochester ..	35	392
L. Cantwell ..	Yarram ..	34	390
W. E. and W. H. Harris	Dumbalk North No. 1	38	389
M. McBayliss ..	Pyramid-Cal-wil No. 3	26	389
C. Dean ..	Gellibrand Valley	22	388
J. Fowles ..	Korumburra No. 4	33	386
H. Kay ..	Swan Hill ..	25	384
L. H. Howes ..	Tongala No. 1	32	383
Mrs. Heath and Sons	Camperdown No. 1	29	383
N. Kuhne ..	Leongatha No. 2	37	381
C. and L. Winchomb	Rochester and Echuca East	29	381
S. Linford ..	Stanhope No. 1	31	380
Mrs. E. Cardwell	Eskdale No. 1	24	380
F. Gallagher ..	Swan Hill ..	20	379
R. Rautman ..	Maffra-Sale and district	32	377
L. Newton ..	Korumburra No. 1	31	377
W. A. Roy ..	Boolara No. 1	20	377
J. McNicol ..	Tongala No. 2	23	374
R. Cunningham ..	Rochester ..	22	374
C. A. Bunn ..	Merrigum No. 1	28	373
C. McKay ..	Ondit-Irrewarra	26	373
A. C. Hickey ..	Korumburra No. 3	32	372
C. Vaughan ..	Ecklin South No. 1	27	372
R. S. Thompson ..	Eskdale No. 1	38	371
P. Taylor and K. Wiese	Rochester ..	35	371
M. Wilson ..	Korumburra No. 1	35	370
N. J. Smith ..	Gellibrand Valley	27	370
J. H. Bond ..	Yinnar ..	30	370

Herds owned by Mr. K. Chisholm and Mr. H. L. Withall, of Leongatha; Mr. F. J. Dinneen, Toora-Welshpool; and Mr. A. E. Tack, of Korumburra, all exceeded the 420-lb. herd average. Mr. H. McLean, of Leongatha, Mr. E. A. Sawyer, of Stanhope, Mr. J. A. Warnock, of Swanpool, Mr. J. Bunn, and Messrs. Stephens Bros., of Korumburra, all had herds around 36 cows, which averaged above the 400-lb. level. There were also 31 herds with a yield of 370 lb. or better.



Three high-producing cows from Mr. D. Connor's herd (Milawa Association).

HERDS OF 40 TO 59 COWS.

Owner.	Association.	Cows.	Butterfat.
Harrison Bros. ..	Korumburra No. 2	41	434
W. Hornsby and Son	Cohuna No. 1	47	418
A. Sims ..	Ondit-Irrewarra	40	401
R. R. Faragher and Sons	Woodford No. 1	58	400
Mrs. M. H. Park	Tallangatta No. 1	52	395
D. K. McKenzie ..	Fish Creek No. 1	53	391
W. Brennen ..	Swanpool No. 1	44	391
Mrs. E. A. Pratt..	Mountain View	43	389
J. G. Howell ..	Leongatha No. 2	55	388
J. S. Bullingham..	Tongala No. 1	43	387
Northey and Co..	Bethanga No. 1	58	386
W. Fleming ..	Tallangatta No. 1	40	385
T. Gaw ..	Bass ..	40	384
J. Martin ..	Stanhope No. 1	44	381
N. Baxter ..	Ecklin South No. 1	56	375
C. A. Schmidt ..	Foster ..	47	374
Gilbert Bros. ..	Yinnar ..	54	372
L. J. Affleck ..	Traralgon ..	57	371
A. G. Bamford ..	Ecklin South No. 1	50	371
A. S. Brewer and A. Murtagh	Myrtleford-Whorouly No. 2	40	371
T. M. Noble and Sons	Maffra-Sale ..	40	370
W. Vagg ..	Yinnar ..	59	368
E. W. Croucher ..	Myrtleford-Whorouly No. 1	48	368
C. W. Smith ..	Rochester ..	47	367
G. White ..	Boolara No. 1	46	364
J. Doyle, Senr. ..	Cohuna No. 1	53	361
A. E. Saunders ..	Maffra-Sale ..	52	360

HERDS OF 40 TO 59 COWS

There were 40 herds in this section which exceeded the 350-lb. butterfat level; space cannot be provided for the full list. In the 27 herds that produced over 360 lb. butterfat, there were four that reached the high level of 400 lb.

The herd of 58 cows owned by Messrs. R. R. Faragher and Son, of Woodford, and which was so prominent in last year's report, has again shown its superiority by averaging 400 lb. butterfat. Mr. A. Sims's excellent herd at Ondit-Irrewarra, and also that of Messrs. W. Hornsby and Son, of Cohuna, have remarkable production figures. The section is led by the herd of 41 cows owned by Messrs. Harrison Bros., of Korumburra, with 434 lb. butterfat.

THE 60 TO 79 COW SECTION

Messrs. Trease Bros., of Dumbalk North, again occupy a prominent position in this section. Their 68 cows averaged 395 lb. butterfat.

Mr. J. Nichol, of Tallangatta, and Mr. T. Armstrong, of Ondit-Irrewarra, with large herds, averaged above the 375-lb. butterfat level. Herds of this size, capable of averaging over 350 lb. butterfat, would be prominent in any dairying country.

HERDS OF 80 COWS AND OVER

Among the leading herds, are some that have been prominent for many years. The leading herd of 83 cows, with 367 lb.

butterfat, is owned by the estate of the late Allan Crosthwaite. The late Mr. Crosthwaite, a pioneer of herd-testing work in Victoria, was well-known in herd-test circles throughout the State. His work in developing a fine dairy herd is apparent in this yield.

Mr. G. J. Bingham was prominent for many years in a Warragul unit; he is now a member of the Mountain View Association, and his herd of 81 cows, with 367 lb. butterfat, is still working at a high level.

Mr. F. J. Olden, of Korumburra, and Mr. C. W. York, of Dumbalk, have yields of more than 343 lb. butterfat for herds of nearly 90 cows.

Mr. C. Runciman, of Swan Hill, 99 cows; Mr. H. Harris, Upper Murray, 85 cows; and Messrs. H. Batten and Sons, of Warrnambool, also have herds averaging yields of more than 300 lb. butterfat.

A. and P. McKenna, Warrnambool, 102 cows; A. N. Alp, Korumburra, 120 cows; and Miss Sassella, Yarram, 129 cows, have herd averages of more than 300 lb. butterfat. Several other large herds also have splendid average yields, which reflect good herd management, good dairy-cattle, and an excellent pasture season.

HERDS OF 60 TO 79 COWS.

Owner.	Association.	Cows.	Butterfat.
R. H. and L. J. Trease	Dumbalk North No. 1	68	lb. 395
T. Armstrong ..	Ondit-Irrewarra	72	375

HERDS OF 60 TO 79 COWS (continued).

Owner.	Association.	Cows.	Butterfat.
J. Nichol ..	Tallangatta No. 1	61	lb. 376
Estate J. Coolahan	The Sisters ..	65	368
S. A. Turner ..	Kiewa Valley No. 1	60	362
G. Vagg ..	Cobden No. 1	62	354
W. H. Findlay ..	Upper Murray No. 2	66	349
G. Harrison ..	Dumbalk North No. 1	73	347
A. Willmott ..	Kongwak ..	60	344
J. Anderton and Son	Warrnambool No. 2	67	335
D. and G. Dodd ..	Dumbalk North No. 1	63	332
Major Bros. ..	Cohuna No. 2	79	331
J. Counihan ..	Bairnsdale ..	71	329
A. J. Brumley ..	Port Campbell No. 1	70	329
H. Walker and Son	Myrtleford-Whorouly No. 2	62	323
E. A. Paynter ..	Gainsborough No. 1	65	321
M. J. Balsarini ..	Rutherglen-Chiltern No. 1	79	320
G. Harris ..	Gellibrand Valley	71	320
Estate S. Clarke ..	Maffra-Sale ..	71	313
W. Cosgriff ..	Korumburra No. 2	62	312
G. E. White ..	Maffra-Sale ..	77	311
A. E. Barton ..	Kiewa Valley No. 2	75	310
Reid Bros. ..	Kiewa Valley No. 2	61	304
N. McGrath ..	Korumburra No. 1	69	301
Cox Bros. ..	Paschendale No. 1	65	301
C. Glasgow ..	Korumburra No. 1	68	300
H. Henry ..	Loch ..	60	300



Some of Mr. A. E. Barton's herd of 75 cows (Kiewa Valley Association). This herd averaged 310 lb. butterfat.

OVER 17,000 COWS EXCEED 300-LB. BUTTERFAT LEVEL

Among the "over 300-lb. butterfat cows," there were nearly 5,000 with yields of more than 400 lb. These excellent records included 453 cows that were above the high average yield of 500 lb. butterfat.

The group of 57 that exceeded the 600-lb. level, included six of more than 700 lb. This group is nearly three times larger than in any previous year. It is

obvious that, although the average yield of all tested cows is unsatisfactory, there is an increasing number of high producers that respond well to sound management, and the feed resulting from an unusually good pasture season.

The leading cow for the year comes from the "Bideford" Jersey Stud of Mr. Chas. Runciman, of Swan Hill. "Bideford Trixie 3rd" produced 786 lb. butterfat, when she finished her lactation very early in the testing season. To prove her great ability she re-calved and again finished test within the year, her yield on this occasion being 708 lb. butterfat.

A similar feat was performed at Korumburra, where Mr. F. W. Hawten's grade Jersey, "Nigger," also finished twice within the year under review, with yields of 720 and 707 lb. butterfat respectively.

HERDS OF 80 OR MORE COWS.

Owner.	Association.	Cows.	Butterfat.
A. Crosthwaite ..	Kiewa Valley No. 2	83	367
E. J. Bingham ..	Mountain View	81	367
F. J. Olden ..	Korumburra No. 2.	83	347
C. W. York ..	Dumbalk North No. 1	89	343
C. M. Runciman..	Swan Hill ..	99	336
H. Harris ..	Upper Murray	85	314
H. J. Batten and Sons	Warrnambool No. 2	87	311
Mrs. B. MacIlroy..	Moyhu No. 1..	85	307
A. and P. } McKenna No. 1	Warrnambool No. 2	102	305
A. and P. } McKenna No. 2			
G. E. and S. A. Beatty ..	Kiewa Valley No. 1	80	304
A. N. Alp ..	Korumburra No. 2	121	303
Miss Sassella ..	Yarram ..	129	300
C. D. Crosthwaite	Kiewa Valley No. 2	94	298
E. M. Bourne ..	Korumburra No. 3	101	297
J. Moore and Co. No. 3	Yarram ..	141	294
R. T. Mitchell (Kelvin Grove)	Paschendale No. 1	82	290



Mr. J. G. Howell, Leongatha South, discussing fodder with the district dairy supervisor. Mr. Howell's herd of 55 cows topped the Leongatha No. 2 Unit with an average yield of 388 lb. butterfat.

Mr. W. J. Rankin's "Sue"—a grade Jersey—yielded 717 lb. at Trafalgar, while Mr. O. Jones's "Ronwyn" made history at Dumbalk North by leading all cows in the South Gippsland area with a 703-lb. yield, produced on the steep hills at Dollar.

There are 51 other records of 600-lb. butterfat or better; these include 7 four-year-olds and 3 three-year-olds.

It will be noted that, by far the greatest number of the over 600-lb. butterfat cows were in Gippsland herds. There were, however, high yielders in every area of the State.

THE FOUR-YEAR-OLD SECTION

Generally, the four-year-old is a third calver, but not infrequently, among Jersey breeders, such cows are milking on their fourth calf before they turn five years of age. When this occurs, the yield is generally equal to her mature ability.

Mr. A. Hasthorpe's "Verna" leads this section with a 690-lb. record at Narracan: Mr. A. Sim's "Peggy", at Ondit-Irrewarra, fills second place with 658 lb. The 627-lb. yield of Mr. J. Whitbourne's "Lizzie", at Bairnsdale, and Mr. A. M. Freestone's "Woolly", at Murchison, with 623 lb. butterfat each, represent areas very remote from one another.

In all, there were over twenty cows in this class that topped the 530-lb. level.



Pit-silage on the farm of Mr. F. W. Clarke, Toora-Welshpool Association.

THE THREE-YEAR-OLDS

Some of the twenty three-year-olds, that produced over 500 lb. butterfat, could well be third calvers. They were led by four young and remarkably capable "over 600-lb." producers.

Mr. A. E. Barton, of Kiewa, occupies top place with "Mermaid", whose yield is 638 lb., while, in the nearby valley at Eskdale, Mrs. Cardwell's "Georgina", runs a close second, with 625 lb. butterfat. Mr. W. A. Roy, of Boolarra, and Trease Bros., of Dumbalk North, represent the Gippsland area, with over 600-lb. butterfat representatives.

THE 12 BEST TWO-YEAR-OLDS

Four over 500-lb. "youngsters", among a considerable number of two-year-olds, produced more than 400 lb. butterfat.

Mr. F. V. Godde's Friesian heifer, "Lily," heads this section with 13,718 lb. milk and 549 lb. butterfat. This heifer, which is tested in the Kiewa Association, yielded as high as 61 lb. of milk a day, and was still producing 42.5 lb. on her last test day. Mr. N. L. Pratt's grade Jersey cow, "Pearl," in the Mountain View Association, follows with a 516-lb. yield. At Undera, "Model," owned by Mr. J. M. Lyle,

produced 509 lb., as did also Mr. W. Matthews' "Waverley Lass" at Leongatha.

BUTTERFAT AND MILK PRODUCTION

The annual average figures of butterfat, milk, and fat percentage, "or test" of all Association-tested cows for the period 1928-47, will be found in the table on page 32.

Heavy culling of low yielders, selection of herd replacements from the better-known families of

the herd, a wide interest in pasture development embracing an increased use of fertilizers, together with conservation of fodder for winter feeding, and the use of sires from tested ancestors, have all played their part in raising the standard.

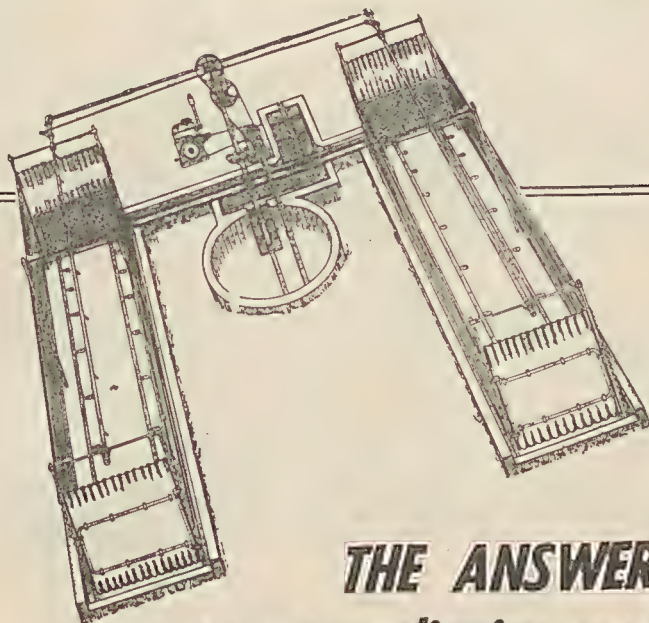
The changeover of a large percentage of farmers to the Jersey breed is reflected in the rapid rise of the butterfat percentage of all tested cows. For many years, approximately 80 per cent. of all bulls used in Association herds have been of the Jersey breed. To this fact must be attributed the static milk yield, and the remarkably high-average butterfat percentage, for these are the well-known characteristics of the Jersey breed.



Some high-yielding cows from the herd of Messrs. D. and G. Dodd, Dumbalk North. The 63 cows in this herd averaged 332 lb. butterfat.

[continued on page 32.]

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LIVE STOCK NOTES

Compiled by A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

BREEDING FARM ANIMALS IN AUSTRALIA

THE development of the breeding of pure-bred stock, the exhibition of animals at fairs and shows, the formation of breed societies and the publication of herd books have all arisen from the desire of men to breed animals better than or different from their neighbours. This has led to the segregation of different kinds of live stock into innumerable breeds each with its own particular value among farmers and fanciers.

Throughout Australia there are thousands of live-stock breeders working with more than 15 breeds of cattle; at least 15 breeds of sheep; 8 breeds of pigs; 8 breeds of horses and many breeds of poultry. Over 50 different breeds of fowls were exhibited at the Melbourne Royal Show last year. Then there are all those enthusiastic breeders of cats, dogs, pigeons, and cage birds. When

looking over this huge field of breeders, and excluding the fanciers whose activities are, in the main, associated with poultry, cage birds, pigeons, cats and dogs, one is rather amazed at the small number of breeds that have been developed in Australia. In fact there are perhaps only five breeds of utility animals, which have been developed here to suit Australian conditions, unless the Corriedale breed of sheep is added to make a sixth. The Corriedale, however, is also claimed by New Zealand, and in fact, most of the leading Corriedale breeders here are importing their stock from that country.

The five breeds regarded as Australian selections are Australian Illawarra Shorthorn cattle, Merino and Polwarth sheep, and Australian White Leghorn and Australorp fowls. Of these, the Merino, the White Leghorn, and the Australorp are superior for the purposes for which they are bred to all other breeds in the world.

Merino Sheep

The Australian Merino sheep has been developed over a period exceeding 150 years. The original breeders crossed and recrossed the sheep originally brought into the country by the early pioneers. The stock were reared under natural Australian conditions with hot, dry summers and cold, wet winters, frequent droughts and the necessity to walk long distances in search of water and scant, low-quality herbage. Under these conditions, only the hardiest survived. In addition to selecting these hardy animals, the breeders selected those which would produce the greatest quantity of the finest quality wool. The virtues of the Australian Merino are its hardiness and ability to produce heavy fleeces of the best quality wool.

It was only because breeders bred and selected their sheep under natural conditions—under the same conditions as the commercial flocks had to contend with—that the breed has been successful. The stud animals were not pampered as with so many imported breeds.

The Polwarth breed is largely an offshoot of the Merino and has been developed in much the same way and, under certain conditions, is regarded as better than the Merino.

Australorps and White Leghorns

With Australorp and White Leghorn fowls the stud stock have been bred, reared and selected under the same conditions as apply to commercial poultry flocks. Here again great success has been attained. If the stud or breeding flocks had been pampered in their feeding and housing, their progeny certainly would not be up to their present high standard, which is as high as the highest in the world.

A big factor leading to the success of Australorp and White Leghorn breeders has been the uniform feeding, housing and management policies practised by commercial and stud poultry farmers in Victoria.

Cattle

The Australian Illawarra Shorthorn breed of cattle was developed in the Illawarra district of New South Wales, where the season is short. The breed was developed to make the greatest use of this short season, by calving at the beginning of the season, and producing a large amount of

milk while it lasted. The early breeders, however, were unable to select cows which would maintain a high level of milk production over a long period or, in other words, which were persistent milkers. It is this defect which is retarding the spread of Australian Illawarra Shorthorn cattle into the better dairying areas of Australia. However, the Australian Illawarra Shorthorns fit admirably in districts where the seasons are short, and breeders are now concentrating on the development of persistent milking strains to improve their breed.

Australian breeders of cattle tend to be overawed with the value of imported animals and some regard any animal which has "Imp." in brackets after its name as superior to any local animal of the breed. In many cases, however, success gained by such animals can be attributed to hybrid vigour.

Breeders of beef and dairy cattle and of British breeds of sheep in this country would be well advised to maintain their herds and flocks under the same environmental conditions as apply to good commercial flocks and herds.

[A.C.T.H.]

BABY PIGS NEED SOIL

While the average weight of 8-weeks-old pigs is probably less than 30 lb., a lot of pigs weigh 40 lb. or more at this age. On the contrary, many weigh as low as 20 lb. These variations in weaning weights have a marked effect on the growth-rate of pigs up to the time they are baconers. The bigger pigs at 8 weeks old are the first to reach 200 lb. liveweight. It is easy to see therefore how important it is to get pigs to heavy weights at 8 weeks old—at least 30 lb. or better still 40 lb. each.

Reasons for pigs failing to reach 30 lb. weight or better at 8 weeks old include small parent stock; poor milking sows; bad feeding of sows and the progeny both before and after their birth, and disease.

One cause of slow growth and general unthriftiness which has been known for many years, but is still overlooked by some pig raisers, is anaemia in sucking pigs caused through a deficiency of iron in their diet. Anaemia occurs in pigs which are kept in pens with concrete, brick or wooden floors and have no access to soil.

Pigs are born with a reserve store of iron in their bodies on which they draw for the formation of red blood until they commence to eat foodstuffs which contain iron. Milk is deficient in iron, and as young pigs usually rely entirely on their mother's milk for nutriment during the first 3 weeks of their life, they require a supplementary supply of iron until they commence to eat foods other than milk, most of which contain iron.

Under natural conditions, newly-born pigs consume some soil, either by "nosing" the ground, or by sucking from the muddy udder of their mother, but when kept in clean pens without earth floors, they are deprived of the iron direct from the soil; that does not mean that it is inadvisable to house pigs in such pens, but it suggests that pigs kept in such pens should be given access to soil by placing a handful (taken from a clean part of the farm away from piggery or dairy drainage) on the floor of the pen every day from the day the pigs are born until they are weaned. This practice is adopted by many of the most successful pig raisers who keep their sucking pigs in intensive pens.

[L. A. DOWNEY, H.D.A., Pig Expert.]

MAINTAIN EGG QUALITY

When the egg is laid, it is, with few exceptions, in perfect condition. Deterioration commences immediately afterwards, and wastage is increased in proportion to the conditions into which it is delivered.

Eggs maintain their original quality for a considerable time when kept at a suitable temperature, but exposure to high temperature causes rapid wastage, and first-grade eggs can be lowered to second quality in a few days. Consequently, they should be cooled as quickly as possible after being laid.

An effective and inexpensive method of maintaining egg quality during hot weather is to store them in Coolgardie safes as soon as they are collected. These safes are simple in design and consist of a wooden frame covered with hessian. A tray of water is placed on top and a reticulation system introduced to keep the walls continuously damp. This system of storage provides an ideal combination of cool air with complete absence of draughts.

Water, particularly during the hot weather, is of vital importance. It comprises 55 to 75 per cent. of the body weight of the bird, and more than 65 per cent. of the egg. It aids in control of body temperature by evaporation through the air-sacs and lungs. The fowl is continually losing moisture in expired air and the excretions.

It is considered that greenfeed, while increasing the vitamin content and pigmentation, has very little influence on the general quality of the egg, but feeding excessive quantities of certain greenfeeds will give deep, orange-coloured yolks which are usually graded as dark-coloured yolks on candling. The actual effect that feeding has on the quality of eggs is not fully known, as birds fed on similar rations produce eggs of varying quality.

Shell Quality in Eggs

Improvement in shell texture can be made in many cases by providing the foods that supply the mineral properties contained in the shell itself. The shell of the egg contains about 90 per cent. calcium carbonate and foodstuffs containing the minerals and vitamins necessary for shell production should help to increase the supply and bring about some improvement in shell quality.

Shell-grit or oyster shell-grit, which is now available in regular supplies, provide calcium carbonate, but without vitamin D, the hen may not be able to convert sufficient quantities to meet the demands for bone and egg-shell formation.

Additional quantities of vitamin D obtained by feeding vitaminized oils have given beneficial results where there has been insufficient sunlight.

Inheritance appears to be a most important factor in the production of strong-shelled eggs, and selection of breeding stock with the ability to lay eggs with strong, good-quality shells, is advised.

[M. D. HALL, Poultry Expert.]

BEEKEEPING

With the flowering of the messmate and stringybark, and ample supplies of pollen and honey at hand, preparations can be carried out for queen rearing, and the formation of nuclei. With the large brood nests in evidence in a favorable early autumn and the hives flowing over with bees, nuclei

building is easily achieved. It is during the autumn that the foundation of next year's results, in many cases, is laid down. Autumn queens raised under good conditions, ample nuclei, good supplies of worked combs, and manipulation of colonies prior to swarming, will in most cases frustrate the swarming fever.

Worker combs can be obtained by placing a couple of frames fitted with full sheets of foundation in the colonies at each round of extracting. Store and give proper attention to the combs that are removed.

The autumn nuclei can be used to advantage to control swarming during the spring by adopting this procedure:—When a colony is found to be very populous, exchange places with the nucleus. The nucleus will collect the field force of the large colony and reduce the desire to swarm for some time. Supply ample comb space to the nucleus and cage the queen if any doubt exists as to her safety.

Advantage should be taken during a good nectar flow in autumn for queen introduction, as the colonies are in a prosperous condition, and a greater percentage of acceptances will be achieved than during a lean period. It is also a good time to repair damaged combs by cutting out any drone brood, and inserting the frames in the brood nest. The combs will be repaired if conditions are favorable within a few days.

It is unwise at this period of the year to take chances with very populous colonies during migration. Give ample room for the bees during confinement, and add a super if doubtful.

[W. A. COLLINS, Apiary Inspector.]

PSITTACOSIS OF BIRDS

A recent human case of the psittacosis brings home forcibly the seriousness of this little-known disease of birds. Primarily a virus disease of birds of the parrot family,

its chief importance lies in its ready transmissibility to man in whom it may cause a mortality of up to 20 per cent.

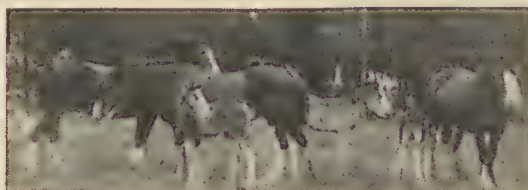
Of the many species of birds of the parrot family susceptible to the disease, two have played a prominent part in conveying the disease to man. These are the Amazonian or green parrot of Brazil (*Chrysotis Amazonicus*) and the well-known Australian budgerigar (*Melopsittacus undulatus*).

Other birds may contract the infection from infected parrots and in turn pass on the infection to man. Many birds living in the wild state are known to harbour the infection, but in these the infection is a "closed" one and generally speaking one of little importance, except where these birds are subjected to conditions which lower resistance such as long voyages, &c. For example, the first indication of the presence of this disease in Australia was its detection in birds which had been shipped from Australia to England. Lowered resistance was the factor converting a latent infection to an active one.

In birds the disease may take one of three forms, namely:—(a) An acute form, from which the bird dies without being obviously sick for any length of time. (b) An acute form in which there is a temperature rise, diarrhoea, nasal and ocular discharge, painful respiration and convulsive tremors; the bird dies in from 4 to 8 days. (c) A latent form in which there is no evidence of clinical symptoms.

On post mortem, the spleen is commonly enlarged, there may be a yellow liver with evidence of inflammation of the intestine and air sacs. The greatest care should be exercised in handling suspect birds. Infection may be transmitted to man from contaminated feathers, contaminated pens, &c. The risk to owners of small aviaries cannot be overstressed, particularly where birds from unknown sources are continually being introduced.

[G. NICOL, B.V.Sc., Veterinary Officer.]



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Development of Clover-Ley Farming at Rutherglen Research Station

The following account of cereal experimental work conducted at the Rutherglen Research Station including the development of clover-ley farming, was prepared by Mr. J. A. Morrow, B.Agr.Sc., Manager of the Station, and Messrs. N. C. Killeen, B.Agr.Sc. and J. G. Bath, B.Agr.Sc., Agricultural Research Officers. This article has been included in a guide book for general distribution and for the information of visitors to the station.

Clover-ley farming, as enunciated by the Rutherglen Research Station, is the rotation of cereal cropping with subterranean clover pastures, irrespective of whether the cropped land is fallowed or not. This clover-ley system is applicable in mixed farming districts where conditions favour subterranean clover, and particularly in districts such as Rutherglen where the average annual rainfall is 22.2 inches per annum, with 16 inches falling fairly regularly in the March-October period.

The system contrasts with the persistent cropping of certain "cultivation" paddocks, with or without fallow, over a long period, interrupted, perhaps, by an occasional spell under natural pasture. The clover-ley system results in improved soil fertility and higher crop yields. When applied without

fallowing, the stock-carrying capacity of the farm is also considerably increased, but this practice requires a concentration of team or tractor strength in the autumn if considerable areas of crop are to be sown. Whatever may be the detailed application of the system, the development of clover-ley farming in suitable districts marks a distinct advance in cultivation practices.

Clover-ley farming at the Research Station commenced in 1922 when subterranean clover was first sown in several paddocks. In 1927 the first crop after clover was grown (No. 3 Field) and demonstrated the greatly improved fertility of the soil, which was maintained for several years. The policy of putting out various paddocks in rotation to clover



1933 wheat plots on land rested in pasture since 1931. Left: Wheat after natural pasture. Right: Wheat after subterranean clover and Wimmera rye grass established with the last cereal crop (oats) in 1931. Note the heavier crop of wheat following the clover.

was continued, and a number of experiments were conducted to measure, by crop yields, the extent of the improved soil fertility. Results of some of these experiments are briefly described below, the more detailed reports having been already published.

Experiment 1

In 1931, a long-term experiment was commenced to compare subterranean clover-ley pastures sown on an old cropping paddock with volunteer-ley pastures self-established on the same paddock, both as a pasture and as a means of restoring fertility to the soil, which had been under cultivation for many years previously.

Portion of a paddock cropped for a number of years, and which carried stubble at the time, was divided into four blocks of equal area; two blocks were sown to subterranean clover (3 lb. per acre) and Wimmera rye grass (6 lb.) with a cover crop of oats. The remaining blocks were left to grow volunteer pasture. The rest of the paddock was maintained under cultivation.

The subterranean clover and rye grass pasture, favoured by good early rains, established itself rapidly and had produced a good sward by the end of 1932. In later years the rye grass practically disappeared from the pasture, leaving an almost pure clover sward. A feature of the clover pasture was the almost complete absence of Cape weed, which was prominent in the composition of the adjoining volunteer or "natural" pasture. The volunteer pasture was slow to establish itself, and, during the first two years, consisted of a thin stand of barley grass, silver grass, and Cape weed. Later, a number of small annual clovers and trefoils appeared, and the pasture thickened up and was capable of providing moderate feed during the winter and spring months. It then dried off rapidly in the spring and provided practically no feed over the summer, in contrast with the clover pasture, the burr from which provided good summer feed.

Both pastures were lightly grazed in 1932, and normal grazing commenced in 1933. After establishment they were regularly topdressed with $\frac{3}{4}$ cwt. superphosphate per annum. From 1933 to 1936 inclusive both pastures carried dry sheep, which were replaced in 1937 by ewes, with 100 per cent. lambs at foot, both types

of pastures being stocked at 2.5 ewes per acre.

During the four years when dry sheep were grazed the subterranean clover pasture carried an average of 2.2 sheep per acre, and the volunteer pasture 1.6, an increase of 38 per cent. in favour of the subterranean clover pasture.

In 1937, the number of ewes carried on both types of topdressed pasture was the same—2.5 per acre—with 100 per cent. lambs, but the lambs produced on the subterranean clover pasture were heavier by an average of 7.8 lb. frozen weight, and were of better quality. The figures clearly show the superiority of the subterranean clover pastures as compared with volunteer-ley.

In order to measure the increase in soil fertility brought about during the period under clover and volunteer ley, as compared with the adjoining area of the paddock which had been maintained under cultivation, wheat plots were sown on portion of each of these sites in 1938, and on the remaining portion in 1940. The wheat was sown on fallow, using $\frac{3}{4}$ cwt. superphosphate per acre. The average yields are shown in Table 5.

TABLE 5.—EFFECTS OF SPELLING LAND IN PASTURES ON THE FOLLOWING WHEAT CROP.

		Average Yield.
		Bus./acre.
Wheat after clover ley	..	31.2
Wheat after volunteer ley	..	26.3
Wheat after regularly cropped land	.. ..	24.4

The crop results demonstrated the high level of fertility reached in the land which had been under clover pasture.

Experiment 2

Similar evidence was obtained in a second experiment, where, in 1937, wheat plots were sown on similar land at the convergence of three paddocks with the following history:—

(a) Regularly cultivated paddock, 1913–28; clover pasture, 1928–37; ploughed and sown, June, 1937.

(b) Regularly cultivated paddock since 1913; fallowed 1936; sown June, 1937.

(c) Regularly cultivated paddock since 1913; wheat crop 1936; sown on stubble June, 1937.

TABLE 6.—COMPARISON OF WHEAT YIELDS AFTER CLOVER-LEY, ORDINARY FALLOW, AND STUBBLE.

—	No Manure.	Super-phosphate $\frac{1}{2}$ cwt.	Super-phosphate 1 cwt.
	bus./acre.	bus./acre.	bus./acre.
Wheat after clover	26.2	34.5	37.0
Wheat after fallow	14.0	26.1	29.4
Wheat after stubble	9.5	12.6	14.2

The yields obtained on clover land without fallow were much higher than those from well-fallowed land adjacent, again demonstrating benefits of clover-ley farming.

CURRENT EXPERIMENTS

Experiment 3

With the above evidence in hand, and having a knowledge of the practical problems involved, a comprehensive series of long-term experiments was commenced in No. 9 Field in 1940. The objectives and progress results are summarized below.

FIELD No. 9.—SECTION A.—CLOVER ROTATION INVESTIGATIONS.

To study the changes in soil fertility on a paddock under clover since 1926 and then cultivated under the following systems:—

- Fallow-wheat.
- Wheat-wheat-clover-clover.
- Wheat continuously.

The design of the experiment is such that a set of plots of each rotation commences every year for twelve years and each treatment is triplicated. In this section, the mould-board plough was used to break up the land as the first operation in each rotation.

When resuming cropping after clover ley the question of whether or not to fallow the paddock must be considered. Table 7 gives comparisons of yields obtained following winter fallow and autumn preparation (non-fallow).

TABLE 7.—COMPARISON OF WINTER FALLOW AND NON-FALLOW FOR THE FIRST CROP AFTER CLOVER-LEY.

—	Average Yields.		
	Three Years Dry Spring Seasons.	Two Years Good Spring Seasons.	Five Years Combined.
	bus./acre.	bus./acre.	bus./acre.
Wheat after fallow	23.9	34.4	28.1
Wheat after non-fallow	15.7	33.7	22.8

In a good spring, differences in yield for the first crop following clover ley have not been significant when comparing winter fallow with non-fallow land prepared in the autumn. On the other hand, fallowing has given marked increases in yield in seasons when spring rains have been deficient. Rainfall records for the past 25 years indicate that on an average one dry spring can be expected in every four years. The figures quoted in Table 7 were obtained in an abnormal period since 1941, when three dry seasons occurred in the five-year period. In normal seasons, the difference in yields probably would be less than indicated by the five-year average.

The results of various rotations after clover ley are given in Tables 8 and 9.

TABLE 8.—COMPARISON OF FALLOW-WHEAT ROTATION AND WHEAT CONTINUOUSLY FOLLOWING CLOVER-LEY.

—	Average Wheat Yields for Four Years.	
	Fallow-Wheat Rotation.	Wheat Continuously.
	bus./acre.	bus./acre.
1st year ..	Fallow	25.7
2nd " ..	29.4	31.9
3rd " ..	Fallow	30.1
4th " ..	30.4	27.4
Total return after four years ..	59.8	115.1

In a well-established clover paddock it is possible to harvest several crops before any marked decline in yield occurs. Table 8 indicates the total yield obtained from four successive crops grown without fallow,

compared with yields for the same period from fallowed ground.

TABLE 9.—COMPARISON OF FALLOW-WHEAT, TWO YEARS WHEAT—TWO YEARS CLOVER, AND THREE YEARS WHEAT—THREE YEARS CLOVER—ROTATIONS FOLLOWING CLOVER-LEY.

	Average Wheat Yields for Two Years.		Three Years Wheat—Three Years Clover Rotation.
	Fallow—Wheat Rotation.	Wheat—Wheat—Clover—Clover Rotation.	
1st year ..	bus./acre. Fallow	bus./acre. 31·6	bus./acre. 30·9
2nd „ ..	36·3	42·3	43·0
3rd „ ..	Fallow	Clover Ley	40·8
4th „ ..	36·4	„ 32·4	Clover Ley
5th „ ..	Fallow	„	„
6th „ ..	31·8	37·6	„
Total return after 6 years	104·5	143·9 plus 2 years grazing	114·7 plus 3 years grazing

The second crop on stubble is generally better than the first crop from ley and compares favorably with the first crop grown on fallow. In the above rotations (Tables 8 and 9) yields from the second year on stubble are not less than those obtained from fallow, and the gross returns show that it is more profitable to grow wheat without fallow under Rutherglen conditions.

The total returns from the various rotations after a longer period of years is given in each table, and favour cropping continuously for a few years after clover ley instead of incorporating a winter fallow. In addition to greater wheat returns, the grazing afforded by the re-established clover pasture is considerable in the relevant rotations, and contributes to improvement of fertility.

In good conditions subterranean clover will re-establish itself after the second crop, but, if a poor strike occurs, a third or even a fourth crop can be grown, and 2 or 3 lb. of clover seed sown with the last cereal crop.

The accumulation of high fertility in a good clover paddock is demonstrated by the high yields from the third and fourth successive crops. Cropping for even longer periods has given surprisingly good results,

although some reduction in fertility is obvious.

The results discussed in the preceding paragraphs apply to Rutherglen and similar districts, but some modification of the practices recommended will be necessary in drier areas.

SECTION B.—FERTILIZER REQUIREMENTS OF CROPS GROWN IN CLOVER ROTATION.

A section of the experiments is devoted to the study of the response to various phosphatic and nitrogenous fertilizers by wheat and oats grown in a wheat-oats-fallow rotation on land cropped after clover.

The fertilizer requirements of crops following clover ley will depend to a large extent on the residual effect of the top-dressing treatment given to the pasture. Tests have indicated that less response has been given to superphosphate in the first crop after clover than is usual on regularly cropped land. Subsequent crops, however, have given better responses. Table 10 shows the average results to date.

TABLE 10.—SUPERPHOSPHATE TRIALS WITH WHEAT AND OATS ON CLOVER LAND.

	Average Yields.			
	First Crop Wheat (Three Years).	Second Crop Oaten Hay (Two Years).	Third Crop Wheat (Three Years).	Fourth Crop Oaten Hay (Two Years).
	bus./ac.	cwt./ac.	bus./ac.	cwt./ac.
No fertilizer ..	19·7	47·0	25·2	66·2
Superphosphate $\frac{1}{2}$ cwt./acre ..	22·8	48·4	31·3	75·2
Superphosphate 1 cwt./acre ..	24·0	47·8	33·3	75·2

NOTE.—The average yields of the various crops shown are not comparable, since they refer to different seasons.

The experiments with nitrogenous fertilizers indicated that, as might be expected, there is no advantage in adding sulphate of ammonia, even on a stubble crop, on land built up in nitrogen content when under clover. Although good crops can be grown on clover land without superphosphate, the experimental results indicate that under present conditions it would pay to use 1 cwt. of superphosphate per acre

with wheat even on clover land. Smaller responses were obtained with oaten hay on the fresh land.

SECTION C.—CULTIVATION PRACTICES IN CLOVER-LEY FARMING.

The third section in No. 9 Field is devoted to investigations concerning various cultivation practices which may be followed in preparing the land for cropping after clover ley. They include comparisons of two depths of ploughing, 3 and 5 inches, and a comparison of the use of the mould-board and disc ploughs and also the rigid-tyne scarifier, both for fallowing and for autumn cultivation without fallow.

In No. 11 Field further aspects of the cultivation of clover ley are being investigated, including the use of a rotary hoe in addition to the above-mentioned implements.

Cultivation methods for crops sown on stubble are under trial in a series of tests in No. 14A Field. The mouldboard and disc plough, the Wimmera scarifier, and the rotary hoe are compared on burnt and unburnt stubbles, all such treatments being sown with both disc and hoe drills.

In clover-ley farming, winter fallowing can be omitted. Tests have shown that, except in very dry years, no great increase in yield has resulted from a fallow period. In addition the yields obtained in the second year from ley for the crop grown on stubble have been as good as those following fallow. (See Table 8.)

If full use is to be made of the pastures, preparation of the soil for the cereal crop will be concentrated into a relatively short period prior to sowing. Any method

which will facilitate the working of the ground will have great advantages.

Although the use of the mouldboard plough is the surer method of breaking up the land to a uniform depth and burying weeds, a disc implement may be preferable under suitable conditions and covers more acreage per day. When the soil is in particularly good condition, as is often the case on land improved in texture under clover-ley farming, a rigid-tyne scarifier might be quite effective in preparing for cropping, and on some occasions good results may be obtained by combining the crop straight in, in one operation. The desirable practice depends entirely upon the seasonal and soil conditions and the time available to cope with the area planned for cropping.

By the choice of implements suitable for the season and the taking of all opportunities for soil preparation following summer or autumn rain, the practice of clover-ley farming without fallowing in the Rutherglen district appears to be very practicable. It has the great advantage of providing more grazing in the spring and allowing the clover to seed, so maintaining the population of "hard" clover seed in the soil for subsequent reconstitution of the clover pasture when the land reverts to pasture after cropping.

Where the area to be cropped is greater than can be handled in a reasonable time in the autumn, it may be necessary to commence cultivation in the spring rather than run the risk of a delayed sowing. This short fallow will extend the period of grazing and help materially in spreading the work where the cultivation of large areas is involved.



Section of the clover-ley farming test plots at Rutherglen.

SOIL REGENERATION BY CLOVER-LEY (No. 2 FIELD)

Experiment 4

Further comprehensive experiments have been laid out in Field No. 2 to obtain information regarding the time necessary to appreciably raise the soil fertility by turning the land out to clover pastures.

Subterranean clover will be established in replicated plots under a cover crop in each of the next five years, and allowed to remain under pasture for periods of 2 to 8 years. After this regeneration period cereal cropping will recommence and changes in fertility will be measured by wheat yields, soil analyses, and wheat quality tests.

PHALARIS TUBEROSA AND CLOVER-LEY FARMING.

The possibility of extending the principle of clover-ley farming to include cropping of land sown to subterranean clover and *Phalaris tuberosa* is being investigated in Fields Nos. 1 and 2. Wheat plots have been sown on a subterranean clover *Phalaris tuberosa* pasture, and it is apparent that the *Phalaris* is capable of withstanding at least one cultivation and cereal crop without damage. These plots will serve as a guide for more extensive tests, and if these are successful, the way will be open for a combination of well-balanced pasture and cereal growing.

ERODIUM.

During the past eighteen years there has been an increase of the weed *Erodium botrys* in the Rutherglen district and in other parts of the State. This weed, which takes up much valuable ground space, and develops undesirable characteristics at seeding, is now becoming widespread and is reducing the value of much of the improved pastures in the district. Conditions which favour sub-clover are also suitable for *E. botrys*, and its control by grazing and other methods is difficult. Where this weed is prevalent the best control appears to be a period of cropping. At least two crops are necessary to check it. Working a farm on a clover-ley system is probably the best method of controlling *E. botrys* without sacrificing pasture or crop yields. Hormone weedicides are being tested out in powder and liquid form on the weed, and, at the same time, observations are being made to note its effect on other pasture plants.

CEREAL EXPERIMENTS ON REGULARLY CROPPED NON-CLOVER LAND

The experiments in the next section have been carried out on the older method of farm management, that of growing cereal crops on paddocks which have been regularly cropped under a wheat fallow, wheat-oats-fallow, or some similar rotation for many years.

Permanent Rotation Trials (No. 1 Field)

The object of the rotation tests in this field is to compare the trends of soil fertility under various cropping systems, other than those involving long periods under pasture, and under conditions similar to those at Rutherglen. Eleven-crop sequences, comprising 30 plots, were included in these tests, and in all of them wheat was the principal revenue-producing crop. The experiment was commenced in 1914 prior to the introduction of subterranean clover, but an important part of the work was the series of plots designed to determine whether, under conditions at Rutherglen, the customary bare fallow could be replaced by a forage crop. The amount of grazing provided and any gain or loss in live weight of the sheep are recorded. There is still a large area of land in the district which is regularly cropped to wheat in a fallow-wheat-oats or similar rotation, and many of the results of these trials are applicable to farms where these practices are continued. The average yield of the wheat crops grown in each rotation system is given below:—

ROTATION TRIALS ON REGULARLY CROPPED LAND (No. 1 Field).

Plots three-eighths acre.

Rotation Number.	Rotation System.	Average Wheat Yield for Nineteen Years.	Average Wheat Yield for Twenty-five Years.
		bus./acre.	bus./acre.
1	Fallow-wheat ..	21.2	21.4
2	Peas-wheat ..	23.5	20.3
3	Rape-wheat ..	21.9	..
4	Rape-peas-wheat ..	24.4	..
5	Rape-barley-peas-wheat ..	23.0	..
6	Rye and vetches-wheat ..	17.2	..
7	Wheat continuously	7.1	7.6
8	Sorghum (Sudan grass)—Wheat ..	16.2	16.5
9	Pasture-fallow-wheat	18.1	19.1
10	Sorghum (Sudan grass)-peas-barley-fallow-wheat ..	19.4	..
11	Oats-pasture-fallow-wheat ..	21.1	21.2

From such an experiment, in which sometimes the cycle is not completed under five years, quick results cannot be expected, but some striking differences in growth have been observed and in some instances the yield of wheat has been greatly influenced by the rotation practised. Land that has been continuously cropped to wheat has produced an average yield of only 7·6 bushels or about one-third of that obtained when the wheat crop has followed bare fallow. The substitution of a summer forage crop, Sudan grass, for the bare fallow has reduced the wheat yield by 4·9 bushels per acre. Where rye and vetches have been alternated with the wheat there has been a notable reduction in yield. In this case the reduction is partly due to the fact that take-all affects both crops in the rotation.

When either of the forages, peas or rape, is sown in the autumn and fed off during the winter and early spring, and the land immediately fallowed the yield of wheat grown on this fallow apparently is not reduced. However, neither of these forages can be recommended for Rutherglen conditions as they do not furnish satisfactory grazing returns here and the rotations including these crops have been abandoned.

The average wheat yields in the rotations including pasture for one year (Nos. 9 and 11) do not differ greatly from that in the fallow-wheat rotation, particularly in recent years. In the early years of the trial, the pasture included Wimmera rye grass sown with the previous crop, but it was found to persist and sometimes reduced the wheat yields. In recent years Wimmera rye grass has not been sown, and oats for grazing have been substituted.

A close study of the trends in the yields obtained indicates that the inclusion of one year of pasture in a rotation has so far shown little effect on soil fertility. This experiment is on a permanent basis, and

will be continued to provide information on the long-term effects of the various treatments on soil fertility. On the other hand, the development of the clover-ley rotation provides a cropping system superior to any included in the tests.

Feeding off and Green Manurial Tests (No. 2 Field)

The objects of these tests were:—

(1) To determine whether the customary fallow for wheat could be replaced to advantage by a forage crop.

(2) To investigate the effect on soil fertility of—

- (a) growing forage crops and feeding them off with sheep; or
- (b) ploughing crops under as green manure.

Outline of experiment:—The forages under test are rape, barley, peas, oats, and rye and vetches.

In the first series each forage crop is sown in the autumn, and fed off with sheep during the winter and early spring, and the plot immediately fallowed. Wheat and oats for grain are sown in the following autumn on this late fallow, and compared with crops grown after a long bare fallow.

In the second series of plots, the treatment is identical with the above except that the forages are ploughed in as green manure instead of being fed off. The plots are each one-fifth of an acre in area. In 1921, the wheat plots were halved, one half being sown with wheat and the other with oats.

The effect of ploughing in and feeding off green crops is thus being determined.

RESULTS OF FEEDING-OFF AND GREEN MANURIAL TESTS.

Yields obtained with wheat and oats grown after bare fallow and in rotation with forages, fed off to sheep, and also



Oat variety trials.

with the same crops ploughed under are shown below :—

Rotation.	Average Wheat Yield for Twenty Years.	Average Wheat Residual Tests 1932-37-38.	Average Oat Yield for Fourteen Years.
<i>Series 1.</i>	bus./ac.	bus./ac.	bus./ac.
Wheat after rape- fed off ..	18.7	23.9	30.9
Wheat after barley- fed off ..	14.6	23.8	32.1
Wheat after peas- fed off ..	19.1	24.0	30.4
Wheat after rye and vetches-fed off ..	19.6	26.8	36.4
Wheat after bare fallow	18.9	23.2	29.8
<i>Series 2.</i>			
Wheat after rape- ploughed in ..	17.5	24.7	29.0
Wheat after barley- ploughed in ..	11.8	20.6	29.5
Wheat after peas- ploughed in ..	17.0	25.4	30.7
Wheat after rye and vetches ploughed in	18.6	26.8	33.8
Wheat after bare fallow	18.7	22.8	32.6

N.B.—Oats replaced rape since 1941, and peas replaced vetches since 1946.

The test is confirmatory to that made in the rotation field in showing that after rape and peas are fed-off to sheep under Rutherglen conditions, the yield of wheat is quite as satisfactory as when the wheat is grown after bare fallow. Unfortunately, both rape and peas have not proved economical to grow at Rutherglen, hence cannot be recommended for similar soils in the district.

The tests confirm those at the State Research Farm, Werribee, in showing that, if barley is used as a forage crop in this way, material reduction in the yield of the subsequent wheat crop is likely.

One outstanding result of the test has been the failure of any of the forage crops to increase considerably the yield of wheat. The unsatisfactory effect of barley when used as a green manure preceding wheat will also be noticed. The result, undoubtedly, is due to the presence of take-all disease in the barley and its transference to the wheat crop.

[continued on page 39.

ORCHARD NOTES

FIELD DAY AT TATURA

By R. A. Mullett, B.Agr.Sc., Horticultural Instructor

A LARGE gathering of fruitgrowers attended a field day held in November last at the Department's Horticultural Research Station, Tatura. Opening the field day, the Director of Agriculture, Mr. H. A. Mullett, expressed regret that the Deputy Premier, the Hon. J. G. B. McDonald, M.L.A., and the Minister of Agriculture, the Hon. A. H. Dennett, M.L.A., had been unable to attend.

Outlining the work of the Department and its value to Victorian agriculture, Mr. Mullett pointed out that the practical results of research carried out by departmental scientists had greatly benefited producers in many fields of primary production. Wheat-growers, for example, were obtaining higher and better quality-yields as a result of manurial experiments and new wheats bred and developed by the Department; stock-owners had derived enormous advantages from pasture improvement and animal husbandry work, while fruitgrowers and primary producers generally had learned the value of the department's services in providing answers to problems with which they, in their endeavours to earn a living, had no time to grapple.

At Tatura, practical results from researches made into tomato culture had resulted in the introduction of two new tomato varieties of great value to the industry, namely, Tatura Dwarf Globe and Tatinter. Research on fruit trees, the main activity at the Station, was also in progress, but as this work was necessarily of a long-term nature, and as the Station had been in operation for only a few years, spectacular results could not yet be expected.



The Director of Agriculture, Mr. H. A. Mullett, addressing orchardists at the field day.

Referring to the need for plant improvement, Mr. Mullett said that there was a definite need in Victoria for plant breeders to deal with annual crops such as vegetables, and the Department hoped to make such appointments.

Mr. J. M. Ward, Superintendent of Horticulture, gave a brief *resumé* of the work being carried out at the Station, and thanked the Advisory Committee for its co-operation in the past and also for its assistance in the work of preparation for the Field Day.

IRRIGATION EXPERIMENTS

The basic principles of irrigation were outlined by Mr. F. M. Read, Chief Inspector of Horticulture, who stated that the irrigation methods of growers, particularly those on permeable soil types, would have to change if dangers from rising water tables were to be avoided. The main change would be in the use of wide shallow furrows and flat grades. This method would enable the

root zone to be wetted more uniformly over the area without overwatering at vulnerable points; but such flat grade irrigation could only be adopted where the general irrigation layout permitted.

Flat grade irrigation using large flows and covering as much of the surface as possible was desirable, too, on heavy impermeable soils such as occurred on the Station and much of the Goulburn Valley. This was to hold the maximum amount of water for the use of the root system in soils which could only be wetted to a shallow depth and the root system was consequently restricted.

Work at Tatura on the timing of irrigations had given valuable information and three methods were being used:—

(1) *The amount of evaporation from a free water surface.*—This work indicated that the evaporation of about 4 inches of water was the longest time allowable between irrigations, after which fruit wilted and trees began to show signs of distress.

(2) *Continuous records of fruit measurements.*—The rate of growth of fruits which were measured every three or four days indicated when irrigations would be necessary.

(3) *The use of the soil auger.*—By this method, the necessity for irrigation is based on the appearance and feel of the soil sampled by the auger.

All three methods were useful and it is hoped later to inaugurate a service to growers indicating when irrigations were necessary.

In discussing irrigation research at present being conducted at the Station, Mr. A. G. Goudie, Horticultural Research Officer, pointed out that the problem of penetration, in some parts of the Goulburn Valley was somewhat different from that on the more permeable areas, as the difficulty on many orchards was to get the water to penetrate sufficiently throughout the irrigation season.

Several methods were being tried out to improve the soil texture, and so penetration, including permanent cover crops such as subterranean clover, white clover and lucerne; volunteer weed growth with a maximum of three cultivations per year; no weeds—no cultivation (using kerosene sprays to kill weed growth); and the application of gypsum. These treatments were being compared with the normal practice of clean cultivation with a winter cover crop.

The only treatment to show any improvement in penetration so far was the use of gypsum at the rate of 3 tons per acre. This resulted in a small but significant increase in penetration. At the moment, only one plot of each treatment was laid down, and these were being used as pilot plots to study management methods before the main block is used for large scale experiments. Satisfactory crops could be produced on this impermeable soil-type by "first-aid" treatments such as frequent irrigations with just sufficient water applied, so that none would remain on the surface to be lost by evaporation.

Mr. Goudie pointed out that this treatment could be fatal to trees on permeable soil types and urged growers to map their properties first by using a soil probe (which is merely a piece of $\frac{3}{8}$ -in. diameter reinforcing steel) to find out just where the impermeable areas were located before using such first-aid methods. This survey should be done between mid-January and mid-February as a temporary good soil structure appeared to persist until this time after each winter.

PEAR STOCK INVESTIGATIONS

Mr. R. S. Harper, Manager of the Station, explained that the problem of root-stocks



Measuring fruit growth at Tatura. Records are kept of the growth rate of fruit for use as a guide to irrigators.

for pear trees was a very difficult one, as most of the stocks used in Victoria were unsatisfactory for one reason or another, while little research work had been done on this subject in Australia.

Vegetatively raised stocks were the best to use, but these were more difficult for the nurserymen to handle. Consequently, most of the stocks used were seedlings which do not run true to type and often show great variation in vigour and other characters. French pear seedlings mostly were used about twenty years ago, but as these were susceptible to pear-root aphis, many nurserymen had changed to Keiffer seedlings, which were resistant to aphis and usually gave a vigorous quick-growing tree compatible with most of the commercial varieties. However, disadvantages were the variation inherent in all seedlings, shorter-lived trees and the fact that black-end was often severe on trees on this stock.

To investigate some of these problems, a comprehensive trial was laid out in 1941, in which a number of different stocks budded to the main commercial pear varieties were planted. The stocks under trial are seedlings of Cole's Hybrid, Winter Cole, Beurre Bosc, Broom Park, several types of Keiffer, Winter Nelis, Beurre de Capiaumont, Josephine, L'Inconnu, and Packham's Triumph. The scion varieties are Williams' bon Chretien, Packham's, Josephine, and Beurre Bosc. This work is of a long-range nature, but some figures on relative growth up to the present show that Winter Nelis is by a small margin, the most vigorous of the seedling stocks for Williams', Packham's, and Beurre Bosc. Kieffer is consistently good, and there appears to be no reason other than the occurrence of black-end to change from this variety in commercial plantings at this stage, although Winter Nelis would be worthy of trial.

FERTILIZER TRIAL ON PEACHES

The work done so far in the fertilizer trial on Golden Queen peaches was explained by Mr. R. A. Mullett, Horticultural Instructor, who stated that the various treatments had only been applied for three seasons to seven-year-old trees and no obvious result had yet appeared. The treatments were sulphate of ammonia—3 and 6 lb. per tree; superphosphate (22 per cent.) 0 and 4 lb. per tree; and sulphate of potash, 0 and 4 lb. per tree. An attempt is also being made to discover whether the application of nitrogen just before harvesting is useful in sizing the fruit and this is being done by withholding half the sulphate of ammonia from half of each plot until about three weeks before harvesting.

Pruning and thinning trials had also been instituted to try to find more suitable methods for Golden Queen peaches.

There are two pruning treatments—one in which many yearling laterals are left on or close to the main leader; the other consisting of a three-year cycle starting from buds on or close to the leader, yearling laterals arising from those buds and these laterals developing into systems of yearling laterals on two-year-old wood. The two thinning treatments are firstly leaving one fruit per 3 inches of bearing lateral and secondly leaving one fruit per 6 inches of bearing lateral.

In the course of this work, valuable information had been obtained, but the Department was not yet in a position to make any new recommendation to growers.

During the day, visitors inspected the property and at the conclusion, Mr. F. Cooper proposed a vote of thanks to the Departmental officers. Mr. J. M. Ward responded on behalf of the Department.

An enjoyable break during the proceedings was the afternoon tea supplied by the ladies of the Toolamba West Branch of the Country Womens' Association.



FERTILIZERS FOR 1948

Registered Brands and Unit Values

By W. R. Jewell, M.Sc., Chemist for Agriculture

REGISTRATION of brands of fertilizers is an annual affair and the list of registered fertilizers appears in the *Victoria Government Gazette* each December. The list for 1948, showing guaranteed analyses and prices per ton, is reproduced in this issue, together with unit values for this season. The list should be retained for future reference by all users of fertilizers.

The list of unit values, which is based on the analyses and prices of simple fertilizers, is practically unaltered this year. The "unit value" is the calculated commercial value of each 1 per cent. of the particular ingredient per ton of fertilizer. The approximate commercial value of any fertilizer can therefore be determined by multiplying the percentage of each ingredient in the guaranteed analysis by its appropriate unit value, and adding together the figures so obtained; in the case of mixed fertilizers, the calculated value will usually be below the selling price, as the calculated value does not include the cost of mixing. The purchaser is thus able to compare the value of any particular fertilizer with the price charged, and to compare the relative values of a number of brands of the same type of fertilizer.

During the war years, the percentage of phosphoric acid in superphosphate was necessarily reduced because of the grade of rock phosphate available; 17, 18, and 19 per cent. supers. appeared on the market. It will be seen from the list that these have now disappeared and have been replaced by one grade only—21 per cent. This higher grade is possible because of increased supplies of rock phosphate coming forward from Nauru Island.

Fertilizers of animal origin, e.g., blood, blood and bone and bonedust, are still in short supply, and are likely to remain so for some time. Registered prices are similar to those in force last year, but it is likely that an increase in price will be approved, to cover increased costs of bags, &c.

The main provisions of the Fertilizers Act have been described so frequently that they

should be familiar to all farmers, but cases still occur which indicate that this is not so. Only recently a number of cases have been reported of the purchase of a particular material largely because of extravagant claims made by the seller. When the material was delivered, the purchaser has become doubtful as to whether it could possess the fertilizing powers claimed for it, and whether it was actually worth the price charged. The material in question was not a fertilizer as defined by the Act so that its sale could not be properly policed, particularly as no legal notice could be taken of verbal statements, no matter how extravagant they might be. In these cases, the trouble had been that the farmer had bought first and asked afterwards. It cannot be stressed too strongly that, when offered an alleged fertilizer accompanied by startling claims but unaccompanied by a label, it pays to inquire from the Chemist for Agriculture before purchasing.

It is not proposed to give the provisions of the Act in detail. It is sufficient to remind farmers that all bags should carry a label stating the brand, name and address of the manufacturer, guaranteed analysis and weight, and that an "invoice certificate," in the form required by the Act, should be received from the seller with each lot of fertilizer purchased.

As the Act also concerns the manufacturer and seller, it is pointed out that the manufacturer or importer is required to register each brand of fertilizer he sells and that it is an offence to sell or offer for sale an unregistered fertilizer. It is the seller's responsibility to see that each bag is properly labelled, and to give an invoice certificate to the purchaser. The provisions of the Act do not apply to sales of less than $\frac{1}{2}$ cwt. and therefore do not apply to the sale of packets of fertilizers in retail stores.

All queries regarding fertilizers, from either farmers or manufacturers, will be welcomed and should be addressed to the Chemist for Agriculture, State Laboratories, Melbourne C.2.

"Bud-Union Decline" Disease in Citrus Trees



By D. M. McALPIN, P. S. PARSAL,* R. ROBERTS and R. H. HOPE.

A serious disease of citrus trees, causing the decline and death, principally of sweet oranges and grape fruit on sour orange stocks, has been under observation in Victoria for six years. Because the disease is characterised first by blockage of the conducting tissues of the bark at the bud-union, it is referred to in this article as "Bud-union Decline". Investigation on this probable virus disease is proceeding and the following paper is in the nature of a progress report.

The first signs in Victoria of bud-union decline disease of citrus trees were noticed during 1941 on Valencia Late and Washington Navel orange trees worked on sour-orange rootstocks. These trees were growing in the Mildura district. Trees of the same stock-scion combinations in the Department's rootstock and fertiliser trial on Messrs. Leng Bros.' grove, Irymple, showed the disease the same year.

A general survey of trees throughout Mildura early in 1946 showed that many sweet orange and grapefruit trees on sour-orange rootstock and a few trees with other stock-scion combinations were declining in health as though attacked by *Phytophthora* root rot, and some were collapsing and dying suddenly. Trees from the nursery stage up to 40 years of age were being affected irrespective of the soil type on which the trees were growing or the cultural practices used in the groves. On the other hand, trees on citronelle and sweet-orange stock, and even unworked sour-orange seedlings adjacent to declining trees on sour-orange stock, were not affected by the disease. Affected trees which were pruned severely, leaving portion of the sweet-orange top, had not recovered, while similar trees cut below the bud-union, produced vigorous, healthy-growing stock trees. In some cases limbs had been

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Washington Navel orange on sour-orange rootstock, showing sudden collapse due to bud-union decline disease. Such a sudden collapse does not usually occur. Most affected trees die slowly.

allowed to grow from the sour-orange stock of affected trees, with a good effect on the health of the scion.

The failure of trees on sour-orange rootstock has been particularly disturbing, because, up till 1941, there had been an increasing demand by citrus growers for trees on this stock, owing to its fairly good resistance to root and collar rots, and the high-quality fruit produced by trees on it.

From the time of the first survey in 1946 until the present, the disease has increased in each grove where declining trees were found. Of twenty affected groves, containing over 10,000 trees with stock-scion combinations considered susceptible, a thorough survey has been made of five groves. The disease has shown itself in varying degrees of decline. The number of declining trees has risen rapidly, but it appears that some years may elapse before all of the trees with susceptible stock-scion combinations show bud-union decline.

VISUAL SYMPTOMS

The first visual symptoms of bud-union decline in the above-ground parts of the tree include a thinning of the foliage right at the top of the tree. Later, all of the leaves become dull green, and still later, they show a general yellowing or chlorosis. Often a heavy crop is set and the fruits remain small and colour prematurely. The

unhealthy leaves fall, new growth is weak and new leaves few, resulting in a sparseness of foliage and even die-back of the tips of the shoots. In such a state of health, the affected trees usually remain for a few years before dying, but about a fifth of the trees collapse and die even before heavy leaf fall has occurred. It is emphasized that these symptoms are not peculiar to bud-union decline, but may be seen on trees suffering from troubles such as fungal root rot, water-logging of the soil, or insect damage to the roots or trunk.

Inspection of the roots of declining trees on sour-orange stock shows a progressive death of the roots from the tips of the small root fibres towards the trunk. The commencement of this rootlet decay actually precedes the symptoms seen in the tops of the trees, but, of course, is not usually detected.

Only the susceptibility of sweet orange and grapefruit trees on sour-orange rootstock to "bud-union decline" of citrus has been mentioned, because it was first noticed in Victoria on these commercially important stock-scion combinations. Later in this article, other combinations which are suspected of being susceptible to this disease are listed, and also those combinations which seem to be unaffected by the disease.

PRELIMINARY RESEARCH

With the cessation of special wartime duties, detailed investigational work with reference to bud-union decline of citrus trees became possible in Victoria.

Following the surveys of the occurrence of this new decline disease, it was realized that the failure, irrespective of grove management and the soil type in which the trees were growing, of the hitherto popular and successful stock-scion combinations—sweet-orange scion on sour-orange stock, and grapefruit scion on sour-orange stock—could be due to an insect or fungal or



Iodine test for Starch.—Left : Good starch test (black band) in roots of healthy Washington Navel on sour-orange rootstock. Right : Complete absence of starch (indicated by lack of any reaction to iodine) in root of declining Washington Navel on sour-orange rootstock.

virus disease. Mr. G. C. Wade, then a plant pathologist of the Department, investigated the disease angle with healthy and diseased trees, but, in a limited amount of work, did not find the regular presence of any particular fungus or bacterium which could explain the rootlet decay and associated tree ill-health.

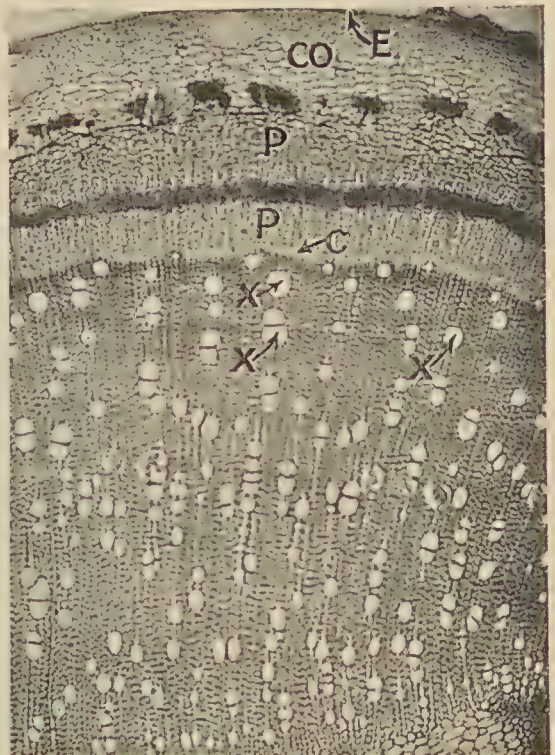
STARCH TEST

The blue colour-reaction given by starch on application of iodine is a simple test for the presence of starch in plant tissues. The depth of the blue colour may be used to obtain comparisons of the starch contents of various specimens. This iodine test for starch has been carried out on large numbers of citrus trees, to study the relative starch contents of various parts, such as the bark and wood portions of the roots, trunk, and branches. Most tests have consisted of lightly scraping the bark, and applying the iodine solution to this scraped surface with an artist's brush.

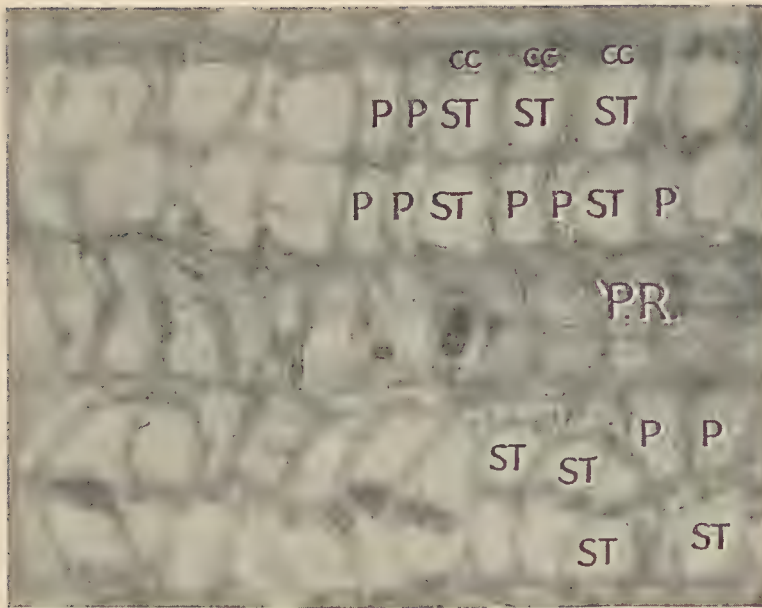
On applying this test to trees in good health, and in various stages of "bud-union decline," it is evident that, even before the appearance of rootlet decay, the starch contents of the bark and wood disappear from certain parts of the rootstock. This disappearance, which is not usual with root-rot diseases or root nematode attacks, occurs first in the bark and then the wood

portion of the small rootlets, and subsequently progresses along the larger roots, till in the most extreme cases there is no starch in the rootstock, right up to the bud-union. The starch disappears last of all from the centre of the wood portion. However, the starch content in the bark and wood above the bud-union is usually at least normal in trees affected by bud-union decline, and is in fact frequently higher in these trees than healthy ones. A deeper blue reaction above than below the bud-union is not consistently obtained in trees affected by this decline disease, but progressive disappearance of the starch from the tip of the roots toward the bud-union occurs in the early stages of the disease.

It is often found that, where trees are suffering from this decline and have reached an unthrifty equilibrium stage, the starch content of the roots has returned approximately to normal. *The starch test is a helpful guide for the onset of the disease, but is not reliable if the affected tree has attained an equilibrium stage of poor health.*



Transverse section through stem of a young citrus tree (7 months old). E = Epidermis, Co = Cortex, P = Phloem, C = Cambium, X = Xylem vessels.



Microphotographs of transverse section of bark immediately below the bud-union of a healthy Valencia Late orange tree on sour-orange rootstock. S.T. = sieve-tubes, C.C. = companion cells, P. = phloem parenchyma, P.R. = phloem rays.

These starch observations suggest that, at or near the bud-union, a checking or slowing down of the movement of food from the tops to the roots occurs. Such factors as stock-scion incompatibility due to poor union of the stock and scion cells, or blockage of the food transport vessels as has been reported to be associated with certain virus diseases, are possible explanations of the results of the starch test.

ANATOMICAL INVESTIGATIONS

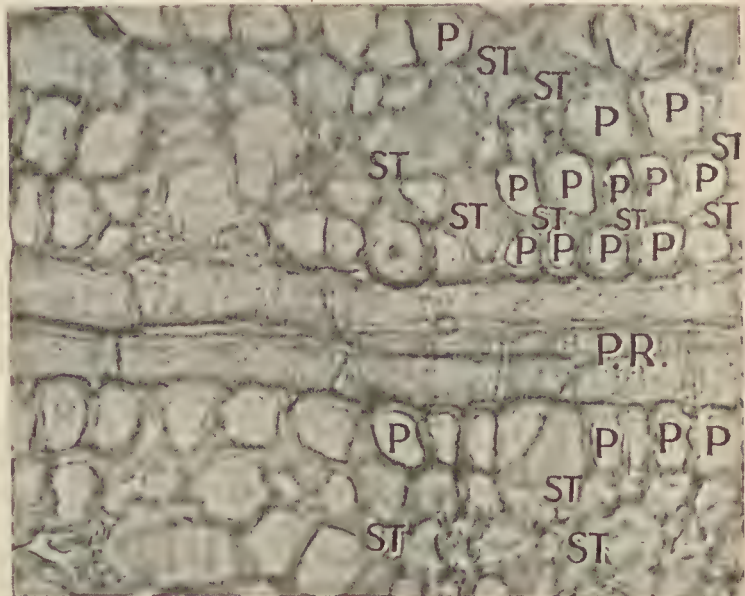
Bearing these possibilities in mind, detailed anatomical investigations have been made in the vicinity of the bud-unions of healthy and declining trees, on sour-orange and other suspected rootstocks.

The material collected is usually "fixed" in form-acetic-alcohol, although in a few instances fresh material has been examined to confirm the results from the fixed material. Transverse and longitudinal sections are cut with

the sliding microtome, and, for rapid examination of a large number of specimens, the sections are stained with phloxine and trypan blue. The stained sections are then mounted in levulose syrup for microscopic examination.

Transport of Food and Water in Plants

The structure of a tree is very complex, but, to enable citrus growers to understand the conclusions reached in this paper, it will simply be mentioned that there are in the tree two types of tissue, each of which may be considered to form a series of delivery tubes connecting the roots through the trunk and branches to the leaves. The active or functional *xylem* "tubes" are in the outer wood and carry minerals and water from the roots to the leaves. The functional tubes of *phloem* are located in the inner bark, and carry foods produced in the leaves down to the roots. The *phloem* is actually composed of a series of long, hollow cells called sieve-tubes (and



A section of bark from a declining Valencia Late orange tree on sour-orange rootstock, immediately below the bud-union. Note collapse of sieve-tubes (S.T.).

companion cells), joined together, and at the union of each pair of sieve-tubes is a perforated *sieve plate* through which the transported food passes. The *phloem parenchyma* cells, which are near the sieve-tubes, store food material such as starch and fat.

It is quite normal for cells of both xylem and phloem to die and cease to function as they become old, and for new functional xylem and phloem to be produced by the cambium, which is a thin layer of especially important tissue lying between the xylem and phloem, and which produces new phloem tissue on its outer wall, and new xylem on its inner wall. If death of the xylem or phloem occurs at a greater rate than the production of new tissue, then decline, and even death of the tree may result.

Anatomy of Diseased Trees

As a result of the above anatomical studies, regular abnormalities have been found in the bark from certain regions of diseased trees. In the early stages of decline, before any visual symptoms are evident, callus pads are formed, covering the sieve plates and extending sometimes throughout the length of the sieve tubes in the region of the functional phloem, at and below the bud-union. This is followed by collapse of the sieve tubes and their companion cells, and expansion of the parenchyma in an irregular manner. These two effects prevent movement of foods from the top to the roots. This irregularity is in marked contrast to the regular arrangement of the old non-functional phloem, where crushing of the radial walls of the sieve tubes and companion cells is a result of pressure from new functional phloem produced by the cambium.

The initial blockage and collapse spreads above and below the bud-union, while root-rotting and general tree ill-health become obvious. Blockage and collapse of the phloem has been found up to 8 inches above, and 10 inches below, the bud-union. The collapse is most intense at and immediately below the bud-union. Blockage and collapse of the functional phloem stops the food materials such as sugars moving from the top of the tree to the roots where storage as starch is usual. Consequently, the roots starve and die, while sending water and minerals to the branches and leaves through the unaffected xylem. Eventually, the roots cannot meet the demand

for water and minerals and the symptoms of ill-health appear in the top of the tree.

The effect of such a blockage is offset to a greater or less extent by the production of new phloem by the cambium. Where trees continue to survive in a diseased state for many years, the greater cambial activity necessary to maintain at least some functional phloem is shown by obvious thickening of the bark in the bud-union region. When a tree collapses suddenly and dies, cambial activity has not been sufficiently increased to maintain enough functional phloem, and no marked thickening of the bark near the bud-union can be seen.

The following measurements were taken just above and below the bud-unions of thirteen-year-old Valencia Late orange trees on sour-orange rootstock.

TABLE OF PHLOEM MEASUREMENTS

		W. Average Total Width of Bark (mm).	F. Average Width of Functional Phloem (mm).	Ratio F/W Expressed as a Percentage.
Trees affected by "Bud- union Decline" dis- ease	Above Bud Union	2.67	0.20	7.5
	Below Bud Union	3.04	0.05	1.6
Healthy trees..	Below Bud Union	2.18	0.72	33.0

In trees affected with bud-union decline, the width of functional phloem is less at, and below, than above the bud union. Also, in declining trees the ratio width functional phloem

total width of bark is less than in healthy trees, at corresponding positions within the region where blockage may occur.

Stock-scion Susceptibilities

These anatomical studies, and, in fact, the starch test on the roots, besides the other symptoms of ill-health in the roots and head of the tree, are neither separately



Top.—Healthy five-months-old budlings (V.L.) orange on sour-orange rootstock. Scion buds taken from a healthy tree on sour-orange rootstock. Lower.—Five-months-old budlings (V.L. orange on sour-orange) showing bud-union decline symptoms. Scion buds from a declining tree on sour-orange rootstock.

nor collectively an invariably sound diagnosis of the conditions for the disease called bud-union decline. The following stock-scion combinations, as found in commercial groves and nurseries, are either definitely susceptible or are listed as "suspect" pending the results of some detailed budding experiments:—

Scion ..	Sweet Orange	Grapefruit	Mandarin
Stock ..	Sour Orange	Sour Orange	Sour Orange
	Grapefruit	Eureka Lemon	
	Kumquat	(Intermediate)	
	Lemon	(Common)	

The following major commercial stock-scion combinations do not appear to be susceptible to bud-union decline of citrus:—

Scion ..	Sweet Orange	Grapefruit	Lemon
Stock ..	Citronelle	Citronelle	Citronelle
	Sweet Orange	Sweet Orange	Sweet Orange
	Trifoliata	Trifoliata	Sour Orange
	Mandarin	Mandarin	Trifoliata
			Mandarin

In two instances, blockage and death or necrosis of the young phloem was found in trees—sweet-orange scion on citronelle rootstock. One of these trees was apparently healthy, and the other declining.

BUDDING TRIALS

In order to determine whether bud-union decline of citrus is transmissible by budding, trials were commenced in the spring of 1946.

In these trials there was evidence, even three months after budding, that bud-union decline may be readily reproduced by inserting sweet-orange buds from a diseased sweet-orange/sour-orange tree into seedling sour-orange rootstocks. Buds from healthy sweet-orange trees on sour-orange stock produced healthy trees when worked on to similar control stocks. Buds from decline trees produced vigorous, healthy, symptomless trees when inserted into citronelle stock. The converse also occurred, buds from a healthy Washington Navel orange tree on citronelle stock producing decline trees when worked on sour-orange rootstock, although giving healthy trees in sweet-orange stock.

The reworking to lemon varieties of declining sweet-orange trees on sour-orange stock is giving very promising results in making use of declined trees, and, in this connexion, it may be stated that no lemon trees on sour-orange rootstock have been found to be affected with bud-union decline.

Other large-scale budding trials, which include the testing of many stock-scion combinations, and their susceptibility to this new disease, are being carried out; also, the extent to which trees with tolerant stock-scion combinations are carrying bud-union decline in their systems, without symptoms, is being investigated.

SPREAD OF BUD-UNION DECLINE OF CITRUS TREES

The budding trials which have been carried out already, show that bud-union decline of citrus trees may be transmitted by budding, and can be present without symptoms in certain citrus stock-scion combinations.

This disease may, therefore, have been brought into Victoria through these symptomless stock-scion combinations or even budwood. In Australia, the introduction from other countries of citrus plant material is strictly controlled, but it is of interest that this disease was not noticed in Victoria till 1941, and, that in 1938 and 1939, Robertson Navel orange trees on sweet orange and sour-orange stocks and Robertson Navel budwood, respectively, were imported from California, U.S.A. No other overseas importations of citrus have been released in Victoria during the last twelve years.

The spread of bud-union decline in the Mildura Irrigation Area of the Murray Valley has been rapid, and cannot be explained by budding alone. While the possibility of an insect vector or vectors seems very strong, study of this particular aspect of the problem is just commencing, and apart from red scale and black aphids, it is not easy to suggest a vector.

VIRUS THEORY AND BUD-UNION DECLINE

The evidence collected since 1946 in Victoria is in favour of a virus being the cause of this new disease, here called bud-union decline of citrus trees.

The sudden appearance of the disease, its distribution and rapid spread, the negative results of tests for fungal and bacterial diseases, besides definite anatomical features, and its transmission by budding, are the grounds for, though admittedly not conclusive proof of, such a virus theory.

It is likely that bud-union decline of citrus is closely related to, if not identical with, problems associated particularly with sweet-orange trees on sour-orange rootstock in South Africa, Java, Ceylon and parts of India, Brazil and Argentina, California, and New Zealand. Research workers in California are convinced that their so-called "quick decline" disease of sweet-orange trees on sour-orange rootstock is caused by a virus, as are also South African and South American investigators of "incompatibility" and "tristeza" respectively.

RECOMMENDATIONS AND WARNING

Pending the results of further research work, citrus growers and intending citrus

growers in Victoria should make sure that their new plantings of citrus areas do not include susceptible stock-scion combinations.

The many growers who have groves with susceptible combinations would be well-advised to interplant their present trees with resistant combinations at the first signs of bud-union decline, so that by the time most of the susceptible trees are affected, a new and resistant grove will be coming into production.

The susceptible and resistant stock-scion combinations are listed on page 30 of this article.

SUMMARY

1. "Bud-union decline" of citrus trees was first noticed in Victoria in 1941, and since that date has spread rapidly.

2. Trees suffer first from blockage and death near the bud-union of the phloem, which carries food from the tops to the roots, then from loss of starch in roots, decay of rootlets and roots, general yellowing of leaves, and signs of ill-health in the head of the tree. Some trees collapse and die suddenly; others persist in a state of poor health for some years.

3. Sweet-orange varieties on sour-orange rootstock, and grapefruit on the same stock, are the most important commercial stock-scion combinations which seem to be affected by this disease, although buds from non-susceptible combinations may carry the disease.

4. Growers are advised not to plant trees with these susceptible combinations. Where areas are already planted, interplanting with resistant combinations is recommended.

5. Budding experiments, study of the death of the phloem cells, the occurrence, spread of the disease and lack of fungal or bacterial disease, point to the disease being virus in nature.

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ASSOCIATION HERD TEST (continued from page 8)

The high-average milk yield of all tested cows during the five-year period, 1928 to 1933, when a large number of big, Jersey grade cows existed in herds—following the recent introduction of Jersey sires—has not since been equalled. However, because of the greatly increased average test, which rose to 4·7 by 1935, the average butterfat yield has remained, in normal years, around the 240-lb. level. The exceptions were the unusually good pasture years of 1939-40, and 1946-47.

If allowance is made for drought years, and the combined effects of restricted fertilizing, feeding, and the shortage of farm labour—repercussions of the war—it will be seen that the average yield of all tested cows has not improved materially during the past fifteen years.



Mowing surplus pasture on the farm of Mr. N. H. Pratt, Mountain View. Mr. Pratt's herd of 35 cows averaged 474 lb. butterfat.

If the peak years of 1939 and 1946 could be maintained, instead of being reached only in unusually good seasons, even this rate of improvement would be far from satisfactory. That better results might be expected is evident from the excellent returns for large herds from almost every area in Victoria during an average dairying season.

SUMMARY OF ASSOCIATION HERD TEST DATA FOR YEAR ENDED 30TH JUNE, 1947.

Area.	Units.	Herds.	Cows Tested.	Junior Cows Under 5 Years of Age.		Pure Bred Bulls.		Average Number of Cows in Herd.	Average Yield per Cow.		
				Juniors.	Per-centage.	Bulls.	Per-centage.		Milk.	Test.	Butter-fat.
Gippsland ..	37	869	31,656	7,915	25·0	863	99·0	36·4	5,411	5·06	274
Western ..	25	588	20,788	4,166	20·0	542	92·2	35·4	5,169	4·72	244
North-Eastern ..	14	302	12,695	2,597	20·5	299	99·0	42·0	5,212	5·01	260
Goulburn Valley ..	17	401	14,164	3,586	25·3	424	105·0	35·5	5,935	4·57	271
Totals 1946-47	93	2,160	79,303	18,264	23·0	2,128	98·3	37·0	5,411	4·88	264

NOTE.—No details—Katandra 854 cows; Port Fairy 935; Orbest 2,106 are not included in this report.

HERD TEST DATA FOR PERIOD 1928-1946.

1945-46 ..	72	1,705	61,738	13,477	22·0	1,623	95·0	36·0	5,043	4·73	239·0
1944-45 ..	59	1,415	53,015	22,396	42·0	1,320	93·0	38·0	4,654	4·68	218·0
1943-44 ..	31	782	27,346	14,988	54·0	805	103·0	35·0	4,740	4·70	223·0
1942-43 ..	25	623	22,154	(Details affected by war conditions)				35·0	4,959	4·70	237·0
1941-42 ..	40	946	34,218	"	"	"	"	36·0	4,960	4·74	235·0
1940-41 ..	70	1,645	60,108	25,988	42·6	1,390	85·0	36·0	5,200	4·70	245·0
1939-40 ..	101	2,346	84,690	34,723	41·2	2,004	85·0	36·0	5,450	4·79	261·0
1938-39 ..	100	2,275	79,805	34,248	42·9	1,904	83·6	35·0	4,749	4·70	221·0
1937-38 ..	104	2,401	86,048	37,467	43·5	1,969	83·0	36·0	4,876	4·70	227·0
1936-37 ..	107	2,350	80,528	36,106	45·0	1,874	81·0	34·3	5,076	4·80	244·0
1935-36 ..	108	2,416	80,817	37,817	47·0	1,946	81·0	33·0	4,934	4·70	233·0
1934-35 ..	113	2,446	79,701	36,116	45·3	1,991	81·4	32·6	5,309	4·59	244·0
1933-34 ..	134	2,910	92,953	43,394	46·0	2,214	76·0	31·7	4,723	4·51	212·0
1932-33 ..	141	3,383	104,009	46,392	44·6	2,619	77·0	31·0	5,290	4·55	241·1
1931-32 ..	130	3,098	89,619	36,946	41·3	2,323	75·6	29·0	5,393	4·58	247·3
1930-31 ..	132	3,085	90,360	32,867	36·4	2,251	73·0	29·0	5,383	4·30	234·0
1929-30 ..	116	2,604	76,032	24,439	32·1	1,653	71·0	29·0	5,044	4·46	226·1
1928-29 ..	96	2,229	63,277	19,246	30·4	1,354	64·0	30·0	5,080	4·38	223·3

BEST 20 FOUR-YEAR-OLDS.

Owner.	Association.	Cow's Name.	Milk.	Butterfat.
			lb.	lb.
A. Hasthorpe	Narracan ..	Verna	9,915	690
A. Sims	Ondit Irrewarra ..	Peggy	11,652	658
J. W. Lilbourne	Bairnsdale ..	Lizzie	10,560	627
A. M. Freestone	Murchison East ..	Woolly	9,480	623
Detrick and Coombs	Yinnar	Bluebell	11,407	614
N. L. Pratt	Mountain View ..	Mable	11,740	608
H. McLean	Leongatha	D. Blonde	8,908	605
E. Gallpen	Fish Creek	Peggy	8,486	602
E. J. Bingham	Mountain View ..	Nancy	12,051	595
F. Dinneen	Toora and Welsh-pool ..	Scarlet	10,075	593
H. Chisholm	Leongatha	Rollo	8,602	586
E. Govett	Rochester	Snowball	11,623	584
J. Moore and Co. No. 3	Yarram	Clara	8,064	566
J. G. Howell	Leongatha	Dinah	10,987	563
T. Gaw	Bass	Susan 9th	8,001	559
H. Walker and Son	Myrtleford	Topsy 3rd	9,997	559
W. Hornsby	Cohuna	Dinah	11,074	558
A. Crosthwaite	Kiewa	Rose	8,023	557
L. J. Afleck	Traralgon	Goldie	9,230	536
L. R. Wight	Stony Creek	Nina	10,998	532
T. Gaw	Bass	Tiger 4th	9,279	532

BEST 20 THREE-YEAR-OLDS.

Owner.	Association.	Cow's Name.	Milk.	Butterfat.
			lb.	lb.
A. E. Barton	Kiewa	Mermaid	12,436	638
Mrs. C. Cardwell	Eskdale	Georgina	10,147	625
W. A. Roy	Boolara	Lady Grey 18th ..	11,100	608
Trease Bros.	Dumbalk North ..	Esther	8,338	600
W. Matthews	Leongatha	Stumpy	10,243	586
C. Runciman	Swan Hill	Gaiety	10,137	573
H. McLean	Leongatha	D. Lola	9,405	562
A. Charlton	Stony Creek	L. Holly	8,751	556
A. Charlton	Stony Creek	L. Rosa 2nd	9,883	550
L. Oliver	Rochester	Debby 2nd	9,410	550
J. Thowlis	Pakenham	Iris 9th	9,310	547
A. Walker	Yinnar	Brownie 2nd	9,431	542
C. Runciman	Swan Hill	Merle 3rd	10,357	529
G. Staben	Korumburra	Ella	11,448	524
Mrs. Heath and Son	Camperdown	Iris 3rd	9,978	515
A. Martin	Gainsborough	Beaty	9,558	514
H. Walker	Myrtleford	Beauty 2nd	9,438	512
M. Bayliss	Pyramid Dingee ..	Nerring Blanche ..	8,800	511
Estate of J. Coolahan	The Sisters	Mona	7,633	508
C. L. Prigg	Rochester	Sylvia 2nd	7,745	505
R. Crouch	Myrtleford	Kathleen	7,454	505
W. Wood	Tallangatta	Carmal	7,038	503
Faragher and Sons	Woodford	Spider	8,292	501

BEST TWO-YEAR-OLDS.

Owner.	Association.	Cow.	Milk.	Butterfat.
			lb.	lb.
F. V. Godde	Kiewa	Lily	13,718	549
N. L. Pratt	Mountain View	Pearl	9,622	516
J. M. Lyle	Undera	Model	9,360	509
W. Matthews	Leongatha	Waverley Lass	9,049	509
H. L. Withall	Leongatha	Bonza	10,790	484
M. Murray	Swanpool	Honesty 13th	7,321	484
D. and G. Dodd	Dumbalk North	Coralie	8,737	482
Ednie and Hill	Gainsborough	Maud	9,634	472
Mrs. Park	Tallangatta	Lady Valda	7,900	471
N. Baxter	Ecklin South	Nola 2nd	8,824	464
L. J. Affleck	Traralgon	Dainty 2nd	9,216	462
A. A. Rix	Pakenham	Melrose Bloom	8,183	457
A. Cruddock	Leitchville	Judy	8,138	453

ASSOCIATIONS GROUPED ACCORDING TO AREA AND PRODUCTION.

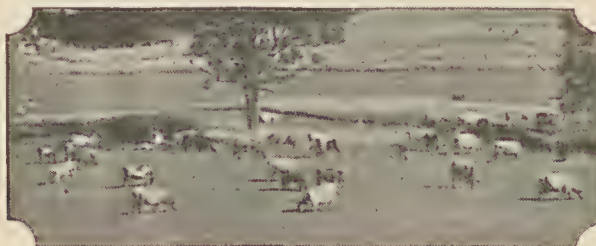
Association.	Number of Herds.	Number of Cows.	Number of Junior Cows Under Three Years.	Number of Pure Bulls.	Average Butterfat Per Cow.
			%		lb.
GIPPSLAND AREA.					
Mountain View	21	745	26.7	22	313
Dumbalk North	23	1,021	22.0	23	312
Leongatha No. 3	26	663	20.4	23	303
Yinnar	24	930	20.8	24	300
Korumburra No. 2	26	1,063	25.2	35	299
Korumburra No. 1	26	1,128	22.4	32	298
Narracan No. 1	24	892	23.0	17	294
Gainsborough	19	809	27.3	22	292
Fish Creek	25	1,038	27.2	36	285
Korumburra No. 3	24	1,036	27.5	36	278
Traralgon No. 2	20	778	23.8	18	278
Maffra No. 1	24	1,010	27.4	28	277
Leongatha No. 2	27	859	26.9	21	276
Narracan No. 2	25	532	31.0	26	276
Warragul No. 1	18	495	30.7	22	276
Boolara	31	1,011	23.2	41	274
Stony Creek	24	861	25.7	15	274
Korumburra No. 4	25	989	26.8	38	271
Traralgon No. 3	31	1,166	23.6	28	269
Yarram	24	1,411	27.4	30	268
Leongatha No. 1	23	1,055	25.2	38	268
Pakenham	19	497	33.6	25	268
Maffra-Sale No. 2	24	774	29.7	22	268
Narracan No. 3	25	651	22.0	17	267
Bairnsdale No. 2	26	654	29.4	22	267
Toora-Welshpool	26	860	21.3	..	266
Bass	26	905	35.3	24	260
Loch	12	447	15.2	10	259
Warragul No. 2	20	526	22.1	25	259
Bairnsdale No. 3	26	925	25.7	27	258
Foster	26	883	17.8	16	255
Maffra No. 3	25	1,226	22.5	38	254
Traralgon No. 1	28	1,274	27.9	27	251
Kongwak	24	1,009	20.9	22	249
Bairnsdale No. 1	23	1,007	24.3	24	243
Buchan	12	352	15.9	5	238
Lang Lang	17	174	13.2	6	198

ASSOCIATIONS GROUPED ACCORDING TO AREA AND PRODUCTION.

Association.	Number of Herds.	Number of Cows.	Number of Junior Cows Under Three Years.	Number of Pure Bulls.	Average Butterfat Per Cow.
			%		lb.
WESTERN AREA.					
Winchelsea No. 1	25	440	18.4	26	286
Ondit-Irrewarra	27	959	19.8	14	285
Ecklin South	25	958	26.1	24	279
Gellibrand Valley	26	912	17.1	19	278
Ballarat	27	647	20.0	34	275
Paschendale No. 1	22	1,092	23.9	24	270
Warrnambool No. 1	19	790	23.4	17	262
The Sisters	20	839	19.4	24	258
Cobden No. 1	26	993	23.1	36	256
Irrewillipe	22	614	25.7	13	253
Port Campbell	26	1,080	18.4	26	251
Pomborneit	21	685	19.3	10	243
Paschendale No. 2	14	944	9.6	14	242
Geelong	22	207	29.5	23	241
Warrnambool No. 2	18	926	18.8	22	241
Nirranda	24	925	19.8	15	240
Woodford	25	1,112	22.2	37	233
Apollo Bay	25	796	18.3	23	232
Condah Swamp	15	430	8.8	21	231
Casterton	23	886	23.3	22	224
Portland	32	1,219	20.0	23	223
Timboon	26	787	23.9	17	220
Camperdown	22	778	20.6	10	217
Macarthur	29	877	15.4	22	209
Cobden No. 2	27	892	18.4	26	206
GOULBURN VALLEY AREA.					
Cohuna No. 1	26	1,117	23.7	33	307
Swan Hill	32	973	27.2	40	302
Stanhope	26	1,011	26.7	22	293
Tongala No. 1	25	914	28.2	34	293
Rochester West	21	648	26.4	21	289
Merrigum	26	909	25.7	24	257
Kerang No. 1	23	823	23.5	26	271
Rochester East	22	900	23.9	22	271
Kerang No. 2	24	796	29.5	23	270
Leitchville	25	792	18.8	28	270
Undera	23	877	30.1	31	266
Tongala No. 2	24	850	25.4	15	264
Kyabram	27	884	23.5	38	250
North Murchison	26	566	22.1	14	241
Pyramid-Calivil	24	776	23.5	16	236
Pyramid-Calivil No. 2	21	434	20.3	15	231
Cohuna No. 2	26	824	25.8	22	223
Katandra	..	..	..	..	..
NORTH-EASTERN AREA.					
Swanpool	25	765	24.1	30	302
Upper Murray No. 2	18	827	16.3	23	281
Tallangatta	22	1,259	17.8	29	276
Kiewa Valley No. 2	21	1,380	23.2	32	271
Bethanga	20	717	17.7	12	268
Myrtleford-Whorouly No. 1	18	625	19.7	22	267
Upper Murray No. 1	19	877	13.3	11	259
Eskdale No. 1	23	965	18.1	32	258
Milawa	20	546	24.7	20	257
Kiewa Valley No. 1	23	1,070	25.1	20	255
Rutherglen	24	731	14.5	26	249
Moyhu	25	874	29.4	21	247
Yea	25	1,002	20.5	25	236
Myrtleford-Whorouly No. 2	19	700	21.1	16	231

LEADING MATURE COWS WHICH PRODUCED OVER 600 LB. BUTTERFAT.

Owner.	Association.	Cow's Name.	Milk.	Butterfat.
			lb.	lb.
C. Runciman	Swan Hill	Bideford Trixie 3rd ..	15,296	786
C. Runciman	Swan Hill	Bideford Trixie 3rd ..	12,487	708
F. W. Hawten	Korumburra No. 2 ..	Nigger	11,967	720
F. W. Hawten	Korumburra No. 2 ..	Nigger	13,065	707
W. J. Rankin	Narracan	Sue	10,075	717
O. Jones	Dumbalk North	Ronwyn	12,963	703
A. E. Tack	Korumburra	Marie	12,335	683
A. Walker	Yinnar	Polly	11,281	671
H. L. Withall	Leongatha	Betty	14,436	666
W. Brennan	Swanpool	Rose	11,165	658
M. Deane	Traralgon	G. Cynthia	14,261	657
Stephens Bros.	Korumburra	Green Glen Music.. ..	11,710	657
R. W. Jones	Boolarra	Bell	10,450	657
C. Runciman	Swan Hill	B. Doreen 2nd	10,519	655
W. Treskill	Bairnsdale	Pansy	10,947	651
Harrison Bros.	Korumburra	Bushby	9,472	643
A. E. Barton	Kiewa	Mermaid	12,436	638
C. Stephens	Korumburra	L. Melody	12,238	633
H. McLean	Leongatha	L. Edna	10,674	633
E. A. Swain	Stanhope	Jewel	11,595	626
H. Matthew	Undera	Queenie	14,223	625
L. Oliver	Rochester	Rita	11,975	619
E. J. Coster	Bairnsdale	Petier	9,060	619
L. Oliver	Rochester	Babes	11,290	618
H. McLean	Leongatha	L. Twinkle	11,411	615
E. J. Hicks and Son ..	Rochester	Joanie	10,362	613
N. L. Pratt	Mountain View	Pet	11,019	611
N. Davidson	Buchan Nowa Nowa ..	Sally	11,916	610
L. Newton	Korumburra	Scotty	13,333	609
J. G. Howell	Leongatha	Hazel	9,040	609
H. L. Withall	Leongatha	Blanch	11,562	608
R. W. Jones	Boolarra	Melva	11,336	608
Sharman and Vodden ..	Swan Hill	W. Polly 19th	10,374	608
Harrison Bros.	Korumburra	L. Estelle	11,357	606
A. Crouch	Korumburra	M. Patsy	9,117	606
W. L. Byrne	Bairnsdale	Lofty	9,405	605
L. S. Hunt	Merrigum	Bonnie	11,795	605
Mrs. B. McIlroy	Moyhu	Dorothy	7,259	605
J. Horn	Irrewillipi	Dandy Queen Bess ..	13,378	604
Harrison Bros.	Korumburra	Trixie	11,674	604
F. Gallagher	Swan Hill	Hall Mark	10,228	604
Faragher & Sons	Woodford	Lady	8,990	603
A. Walker	Yinnar	Nancy 3rd	9,999	603
E. Gallpen	Fish Creek	Peggy	8,486	602
L. Harris	Leongatha	Goldie	9,860	601



CHICK SEXING

RESULTS OF EXAMINATION

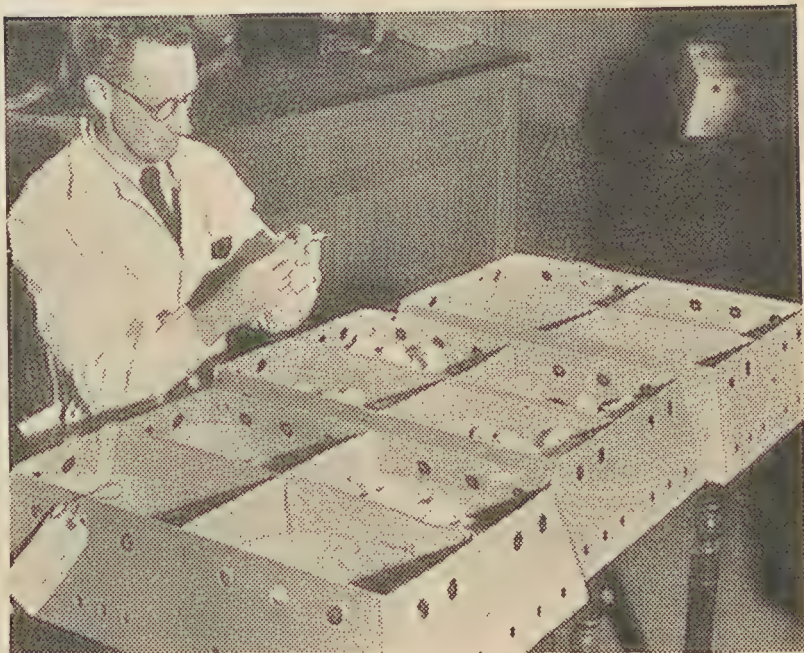
By M. D. HALL, Poultry Expert

AN examination in chick sexing was conducted by the Department of Agriculture in October last, covering a period of eight days, commencing Tuesday 7th and finishing on Friday 17th.

Special and First Class Certificates have been awarded to candidates from the commencement of the examination in 1938, and Second Class Certificates were awarded for the first time in 1944.

Candidates for a Special Certificate are required to sex 300 chickens in 45 minutes, with an accuracy of 98 per cent., without killing or injuring a chicken. Those sitting for a First Class Certificate are required to sex 200 chickens in 30 minutes, with an accuracy of 95 per cent., and for a Second Class Certificate, 200 chickens in 50 minutes, with an accuracy of 95 per cent., without killing or injuring a chicken.

During the course of an examination, candidates for the Special Certificate who are unsuccessful in qualifying for this certificate can qualify for either a First or a Second Class Certificate for the first 200 chickens sexed, provided that the conditions governing the respective classes are complied with. Similarly, candidates for a First Class Certificate can qualify for a Second Class Certificate and also, those sitting for a Second Class Certificate can qualify for a First Class Certificate.



Sexing chickens under a high-powered lamp.

[Leader photo

RESULTS

Forty candidates presented themselves for examination—6 for a Special Certificate, 32 for a First Class Certificate, and 2 for a Second Class Certificate. Of the total number of 40 candidates, Miss E. Bruce qualified for a First Class Certificate, having obtained an accuracy of 95 per cent., and Messrs. E. G. Williams and M. Akam qualified for a Second Class Certificate, each having obtained an accuracy of 95 per cent., and their names have now been added to the list of qualified sexers. Another candidate qualified for a First Class Certificate, but had already received this certificate in a previous examination.

LEARNING TO SEX

Chick sexing is difficult to learn, and, in order to become proficient, it is necessary to receive expert tuition, and to have considerable practice and experience with thousands of chickens. Reliable authorities have stated that a student must sex at least 250,000 cockerels before the male genital eminence can be accurately recognized. The expert sexer appears to be endowed with a natural ability to recognize and classify the various types of genital eminences to be found in chickens, but accuracy is only obtained by regular practice, investigation of errors and a liking for the job.

Most students learn to recognize the typical genital eminences of both sexes, but it is the unusual types that are difficult to sex. These represent approximately 10 per cent. of all chickens, and can only be accurately classified under the guidance of an expert tutor.

It is not advisable for students to undertake commercial chick sexing before they have completed their studies, as they keep repeating their errors, and, therefore, may never attain a satisfactory degree of accuracy.

COMPLETE LIST OF QUALIFIED CHICK SEXERS

A list of holders of chick sexing certificates, issued by the Department of Agriculture since the commencement of the examinations in 1938, is shown hereunder :—

Special Certificate

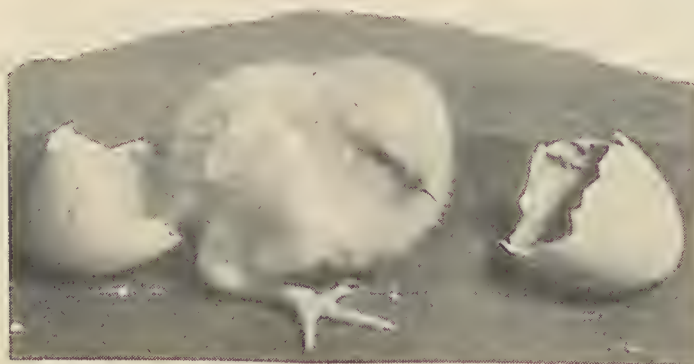
- Mr. K. C. McLister, 176 Hall-street, Spotswood, W.14.
(Awarded 1939. Accuracy 99·0 per cent.)
Mr. H. A. Jenkin, 18 Corio-street, Belmont, Geelong.
(Awarded 1939. Accuracy 98·7 per cent.)

First Class Certificate

- Mr. E. J. Marchant, 56 White-street, Mordialloc.
(Awarded 1938. Accuracy 98·0 per cent.)
Mr. T. H. Pettigrove, Fulton-road, Box Hill. (Awarded 1938. Accuracy 97·5 per cent.)
Mr. W. J. Millington, 1 Lyne-grove, West Brunswick, N.12. (Awarded 1938. Accuracy 96·5 per cent.)
Mr. C. Bode, Research P.O. (Awarded 1939. Accuracy 96·0 per cent.)
Mr. D. Martin, 9 Glenluss-avenue, Werribee. (Awarded 1946. Accuracy 96·0 per cent.)
Mr. A. T. Hewett, Central-avenue, Bayswater. (Awarded 1945. Accuracy 95·0 per cent.)
Mr. L. J. Smith, Cotterell-street, Werribee. (Awarded 1945. Accuracy 95·0 per cent.)
Mr. A. Bradshaw, Valley-road, Highton, via Geelong. (Awarded 1946. Accuracy 95·0 per cent.)
Miss E. Bruce, Glenormiston South, via Terang. (Awarded 1947. Accuracy 95·0 per cent.)

Second Class Certificate

- Mr. E. Bourbaud, 3 Watkins-grove, Mordialloc. (Awarded 1946. Accuracy 95·0 per cent.)
Mr. M. Akam, 3 Davies-street, Brunswick, N.10. (Awarded 1947. Accuracy 95·0 per cent.)
Mr. E. G. Williams, 91 Tone-road, Wangaratta. (Awarded 1947. Accuracy 95·0 per cent.)



In order to ascertain whether the cumulative effect of the green crops on the soil is masked by the green crop depleting the soil of moisture and thus limiting the growth of wheat, the two series of plots in this field were left in fallow during 1930-31 and 1936-37, instead of being sown to green crops as usual. Unfortunately, the wheat crops sown in 1931 were so badly waterlogged that the yields obtained gave no indication of the gain or loss of fertility. However, satisfactory crops were obtained in 1932, 1937, and 1938, and the average results are shown in the table. Some increases were obtained following all forages except barley, but the results so far obtained by these methods of restoring soil fertility are not encouraging, and other tests have shown that a more economic and practical method is the rotation of crops with improved clover-rich pastures.

Permanent Manurial Trials, Wheat and Oats (No. 1 Field)

Twenty wheat and twenty oat plots are embraced in this section. The plots, one-tenth of an acre each, are sown on land alternately under crop and bare fallow, and the site of each plot is permanent. In respect to all other factors, such as cultivation, seeding, &c., the plots are treated as uniformly as possible. The varieties used are Baldmin wheat and Algerian oats. The results from this section, showing the average yields of wheat for 27 years, and of oats for nineteen years, are set out in the following table.

The application of superphosphate has given the most profitable results for wheat and oats. The use of other manures, such as nitrate of soda, &c., in conjunction with superphosphate, apparently has given increases, but such increases have not been sufficient to justify the additional expense incurred.

The results of the above trial, and of tests in other fields on the station indicate that, with present price levels of the grain and superphosphate, a dressing of at least 1 cwt. of superphosphate per acre is desirable when sowing wheat or oats on fallowed land at Rutherglen.

MANURIAL TRIALS—WHEAT AND OATS.

Manure Applied per Acre (on Fallow Land).	Wheat— Average Yields for Twenty- seven Years.	Oats— Average Yields for Nineteen Years.
	bus./ac.	bus./ac.
Farmyard manure, 10 tons ..	19.7	31.7
Farmyard manure, 10 tons + lime, 10 cwt. ..	23.0	34.7
No manure ..	9.9	19.8
Superphosphate, $\frac{1}{2}$ cwt. ..	20.8	35.1
Superphosphate, 2 cwt. ..	23.4	38.6
Superphosphate, 1 cwt. ..	22.5	39.1
Superphosphate, 1 cwt. + nitrate of soda, $\frac{1}{2}$ cwt. (with seed) ..	25.1	39.6
Superphosphate, 1 cwt. + nitrate of soda, $\frac{1}{2}$ cwt. (in spring) ..	23.5	40.2
Superphosphate, 1 cwt. + sul- phate of ammonia, 44 lb. ..	24.2	39.9
Superphosphate, 1 cwt. + sul- phate of ammonia, 44 lb. + sulphate of potash, $\frac{1}{2}$ cwt. ..	22.7	34.4
No manure ..	10.2	21.7
Bone fertilizer, 1 cwt. ..	20.6	36.7
Basic slag, 1 cwt. ..	21.3	34.4
Basic slag, $\frac{1}{2}$ cwt. + superphos- phate, $\frac{1}{2}$ cwt. ..	22.4	37.5
Superphosphate, 1 cwt. ..	21.4	36.3
Superphosphate, 1 cwt. + lime, 5 cwt. ..	24.4	38.8
Superphosphate, 1 cwt. + lime, 10 cwt. ..	23.8	36.8
Superphosphate, 1 cwt. + lime, 20 cwt. ..	25.0	39.1
No manure ..	9.9	19.5
Superphosphate, 1 cwt. + sul- phate of potash, $\frac{1}{2}$ cwt. ..	22.5	37.2

NITROGENOUS MANURES ON REGULARLY CROPPED LAND.

(a) With Wheat.

In order to study more completely the action of nitrogenous manures, particularly sulphate of ammonia, replicated trials with wheat have been sown on both fallow and stubble ground.

In all cases the nitrogenous manure used, sulphate of ammonia, was applied at the time of sowing.

The results of these experiments do not indicate that a profitable response from the use of nitrogenous manures, either on fallow or stubble ground, can be expected in the Rutherglen district with wheat.

RESULTS OF NITROGENOUS MANURE TRIALS ON WHEAT.

Manure Applied per Acre.	Average Yield Five Years.	
	Fallow.	Stubble.
	bus./acre.	bus./acre.
No manure	20·6	16·1
Superphosphate, 1 cwt. ..	31·4	21·9
Superphosphate, 1 cwt. + sulphate of ammonia, $\frac{1}{2}$ cwt. ..	31·7	24·0
Superphosphate, 1 cwt. + sulphate of ammonia, 1 cwt. ..	30·8	22·6

(b) With Oats.

Nitrogenous manures have greater possibilities with oats sown for hay on ground which has been under cultivation for some years, and profitable results have been obtained by using sulphate of ammonia with superphosphate, particularly on stubble land.

RESULTS OF NITROGENOUS MANURE TRIALS ON OATS.

Manure Applied per Acre.	Average Yield Five Years.	
	Fallow.	Stubble.
	cwt./ac.	cwt./ac.
No manure	36·4	29·1
Superphosphate, $\frac{1}{2}$ cwt. ..	47·9	32·6
Superphosphate, 1 cwt. ..	52·1	34·1
Superphosphate, $\frac{1}{2}$ cwt. + sulphate of ammonia, $\frac{1}{2}$ cwt. ..	53·8	41·7
Superphosphate, 1 cwt. + sulphate of ammonia, $\frac{1}{2}$ cwt. ..	59·6	42·3

NOTE.—In the above table yields on fallow are not comparable with yields on stubble because the averages cover a different period.

CULTIVATION TESTS

This cultivation trial has now been completed, and its results are applicable to heavy soils that have been regularly cropped for many years. Further trials on land managed under the clover-leys farming system are being conducted in other fields.

WHEAT CULTIVATION TESTS ON REGULARLY CROPPED LAND.

Average Results for Twenty-two Years to 1937).

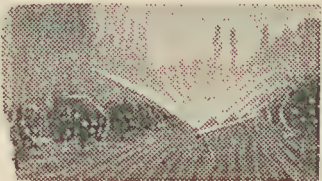
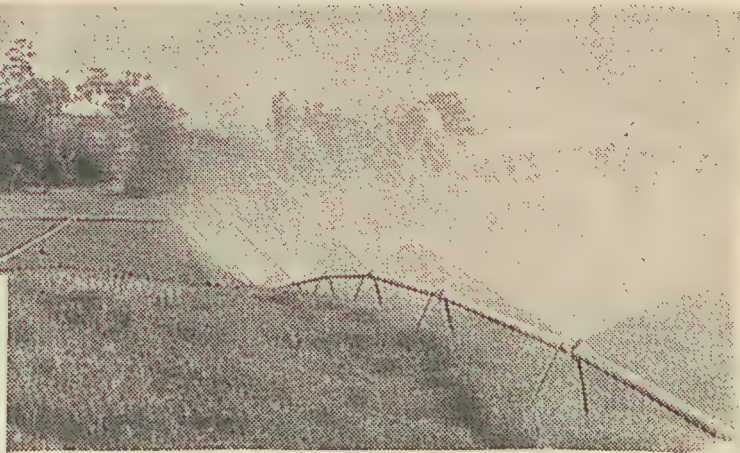
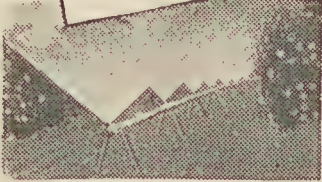
Treatment of Plot.	Yield per Acre.
	Bushels.
Ploughed 3 inches July, and well worked	21·9
Ploughed 5 inches July, and well worked	26·1
Ploughed 7 inches July, and well worked	27·5
Ploughed 9 inches July, and well worked	25·6
*Ploughed 3 inches July, subsoiled, and well worked	23·7
*Ploughed 5 inches July, subsoiled, and well worked	24·9
*Ploughed 7 inches July, subsoiled, and well worked	25·9
Ploughed 5 inches July, and well worked	24·8
Ploughed 5 inches July, and neglected (grazed only)	16·7
Ploughed 5 inches October, and well worked	20·1
Ploughed 5 inches October, and neglected (grazed only)	19·4
Ploughed 5 inches just before seeding (non-fallow)	13·3

* Not sub-soiled since 1923.

The results demonstrated the advantages of early well-cultivated fallow, and that deep ploughing resulted in higher yields. Sub-soiling had no apparent influence on the yields. In clover-leys farming, it is not advantageous to fallow for such a long period before cropping.

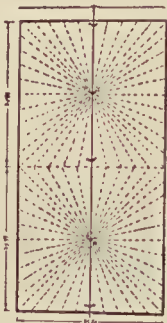


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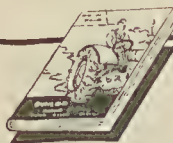
D.509

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IN THE GARDEN

By T. H. KNEEN, B.Agr.Sc., Principal, School of Primary
Agriculture and Horticulture, Burnley Gardens

NURSERYMEN are budding roses now and if you have any special fancies now is the time to place an order before it is too late. A climbing rose which has been most spectacular during the past spring is Paul's Scarlet. It looks particularly well covering a grey paling or brushwood fence. Two prominent garden roses this season have been Picture and Texas Centennial. The latter is an extremely vigorous grower and a worthwhile choice for the beginner.

A good type of Camellia is Spencer's Pink, a pale soft pink single variety. *Optima* is an excellent striped pink variety, very free-blooming. One of the best Camellias the writer has seen is Camellia var. *Mathotiana*. The double flowers are of perfect form and of a deep red colour. The plant itself blooms profusely from quite an early stage.

A conspicuous Azalea is the Japanese variety *Hinodegiri*. It carries a dense mass of bright crimson flowers. An excellent double purple Azalea is *Temperance*, a good light rose one is *Pauline Mardner*, while *Deutsche Perle* is a good white.

Fuchsias should not be overlooked and one of the most useful varieties is *E. G. Hill*, red and white. This variety is most useful for screening a shaded wall or fence.

SEED SOWING

Many seeds may be sown this month to give bedding and cut-flowers in the winter and spring months. In their natural habitat most of these would not germinate until the first rains of autumn and would not bloom until the spring. Early blooming therefore requires early seed sowing. The main point

to remember is that the hot weather of January and February can be most unkind to young seedlings unless particular attention is given to watering, and to protection from the full force of the sun and drying winds.

Apart from seeds which are better sown where the seedlings are to remain, the two main methods of sowing seeds are in either open seed beds or seed boxes. For either of these methods a good seed compost is made by adding one part of well-decayed manure to four or five parts of sandy loam.

An area of 6 ft. by 3 ft. will provide ample room for an open seed bed and so much the better if it is enclosed by a wooden frame 6 to 9 inches high. This frame can be used to support a hessian blind or one made from brushwood. A dense material is not suitable as it tends to restrict ventilation. Seeds can be sown in selected spots in the open garden, using brushwood to protect the seedlings, especially if the soil is one that is easily worked to a fine tilth and reasonably free of weeds.

Seed boxes may range from the familiar "flats" seen in the florists' shops to boxes measuring say 18 by 18 inches and up to 6 inches in depth. The shallower boxes are more economical to handle but more care is required to avoid drying out in hot weather.

The seed compost should be passed through a quarter-inch sieve to achieve reasonable uniformity and, whether in seed bed or box, should be well firmed. Seedlings do not thrive in very loose soil, and in any case the soil is apt to dry out very quickly. It is important to see that the soil surface is level, to prevent run-off and seeds being washed out.

THE VEGETABLE GARDEN

By GEORGE HYAM, Horticultural Supervisor

SUMMER LETTUCE

IT is not difficult to keep up continuous supplies of lettuce during the hotter months if some simple cultural methods are followed and, above all, if appropriate varieties for the season are sown. For January and February sowing or planting, only the black-seeded kinds of cabbage lettuce should be used. Of this type, Imperial 847 is an outstanding variety.

In northern districts where cabbage lettuce may sun-scald in summer, the small mignonne lettuce will stand up to dry and hot conditions where others will fail. In summer, lettuce will do quite well in partial shade. It will be a little slower in maturing in these situations, but seeding will be delayed, thereby extending the period during which the lettuce may be used. A small January sowing in the open, and another in shade will provide lettuce until the autumn crop is ready.

In the open, during the summer, lettuce should be sown direct in the beds and not transplanted. In the shade, lettuce can be sown direct and there will be little loss in transplanting seedlings. Thin the sown rows when the plants are 2 inches high. Lettuce sown or transplanted in the height of the summer should be planted at the bottom of a shallow trench about 2 inches deep and 3 to 4 inches wide. This protects the very young seedlings from hot wind and allows the soil surrounding them to be flooded. Cover seeds and the roots of transplants with a light mulch of rotted stable manure or compost, increasing the mulch as the plants develop so that their roots are always well-protected from the heat. Furrow watering is best in hot weather, but if sprinklers are used, evening watering is preferable to watering during the heat of the day.

THINNING OUT PLANTS IN HOT WEATHER

In addition to lettuce, November–December sown root crops will require thinning and there will be weeds to be pulled. Before doing this, see that the soil is quite moist so that the plants to be left are not unduly disturbed. In heavy clay soil, it is better to chip off the crowns of the surplus plants if the earth tends to come away in clods. Give the beds a good watering as soon as possible after thinning to consolidate the soil round the remaining plants, and afterwards earth up the rows so that the crowns of the plants are just at or slightly below soil level. In summer, thinning should be done twice; first space the plants about 2 inches apart when they are 2 inches high, and about a month later, when the top foliage is getting bushy, thin to the final spacing.

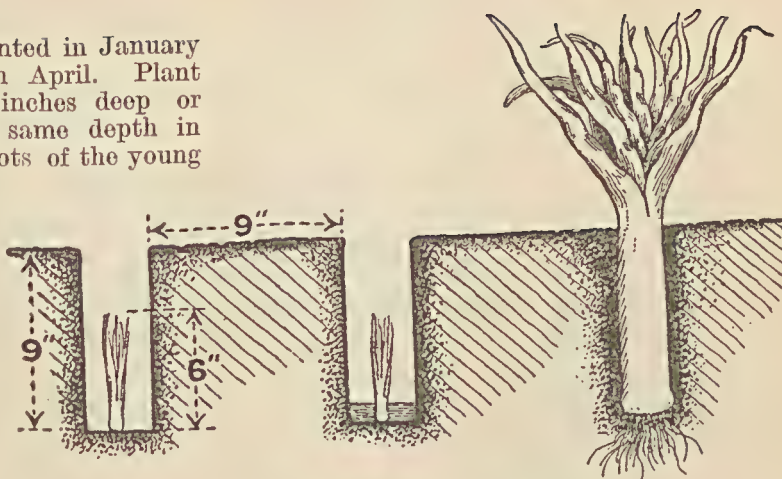
GREEN LEAF CROPS FOR THE AUTUMN

Silver beet and Chinese cabbage sown in January will provide green vegetables from March onwards, and thus fill in a gap until the early winter greens mature. Sow three seeds in each planting position, 18 inches apart, and thin to one plant three or four weeks later. Both species will make rapid growth if planted in soil enriched with stable manure, supplemented by 3 oz. of blood and bone to the square yard. After the sixth week, apply a side dressing of sulphate of ammonia at the rate of $\frac{1}{2}$ oz. to each plant in dry or liquid form, repeating this application every six weeks during the whole period of harvesting.

Some leaves may be pulled for use eight weeks after sowing, using the outside leaves, but leaving those in the centre to protect the heart of the plant. The seedlings of "Succession" cabbage and "Greenleaf" cauliflower may be planted out in January.

LEEKS

The seedlings of leeks planted in January will reach a usable size in April. Plant them in trenches about 9 inches deep or in individual holes of the same depth in rich soil just covering the roots of the young plants with soil, and spacing them about 5 to 6 inches apart. When the foliage grows to about 4 inches above the trench or hole, start to gradually earth them up so as to blanch their stems. The quality of leeks is dependent on abundant watering, heavy feeding, and blanching; starved leeks will be coarse and stringy.



A simple method of planting leeks in the home garden.

CULINARY HERBS

Herbs required for drying should be cut early this month. The best time is the early morning when their volatile essential oils which carry the flavour are best retained in the leaves. Cut the stems near the

crown; tie in small bundles equivalent to one handful, hang these in a cool but airy situation until they are quite dry, first enveloping them in paper to catch fallen leaves. When perfectly dry, rub off the leaves, pack in air-tight jars and store in a dark place.

Soil Conservation Competitions

Goulburn Catchment Area

The Soil Conservation Board announces that the fourth annual Goulburn Catchment Soil Conservation Competition will be held early this year. The competition is open to farmers and graziers within that portion of the Goulburn Catchment embraced by the Shires of Mansfield, Alexandra, Yea, Broadford, Kilmore, Pyalong, Seymour, Goulburn, Violet Town, Euroa, Benalla; the Parishes of Pine Lodge, Dookie, and Currawa in the Shire of Shepparton, and that part of the Shire of Healesville north of the dividing range.

Upper Murray Region

Another competition for soil conservation will be conducted early in 1948 in the Upper Murray Region. This competition is open to farmers and graziers within the area embraced by the Shires of Upper Murray, Towong, Bright, Oxley, Yackandandah, Beechworth, Wangaratta, Wodonga, Chiltern, Rutherglen, Yarrawonga.

The Board, in inviting landholders to submit entries in both competitions, emphasizes that it is not necessary for a landholder to have undertaken any special measures of conservation, to be successful in the competition. Those who, by wise management, have kept their properties free from erosion have achieved conservation of the soil equally with those who have had to take drastic steps to arrest damage that has been brought about by earlier misuse of land.

Entries may be lodged with the Secretary, Soil Conservation Board, Kurrajong House, 175 Collins-street, Melbourne.

Entry forms may be obtained on application to the Board or from the offices of any of the Shires mentioned. There is no entry fee.

Entries for both competitions close on the 14th February, 1948, and judging will take place during March and/or April, 1948.

REGISTERED FERTILIZERS

ANALYSES AND UNIT VALUES

Fertilizers Act 1928 (No. 3680).

UNIT VALUES FOR THE YEAR 1948.

	£	s.	d.
Nitrogen, organic, as Blood ; Blood and Bone ; Blood, Bone, and Flesh ; and Bone ..	1	0	0
„ as Nitrate	1	3	2
„ as Ammonia	0	18	0
Phosphoric Acid—			
as Water Soluble in Superphosphate and Mixed and Complete Fertilizers containing Superphosphate	0	6	4
as Citrate Soluble	0	5	0
as Citrate Insoluble—			
in Superphosphate and Mixed and Complete Fertilizers containing superphosphate, except mixtures of super and bone or blood and bone	0	2	0
in other Fertilizers	0	5	0
Potash—			
as Sulphate	0	9	3
as Chloride	0	8	0

W. R. JEWELL, M.Sc., F.R.I.C.,
Chemist for Agriculture.

Melbourne, 2nd December, 1947.

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1948.

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Unspecified.	Price asked per ton.*	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
<i>Nitrogenous—</i> <i>Readily Available.</i> Nitrate of Soda	Sickle in diamond	16.00	..	..	..	..	16.00	..	..	..	..	..	18 10 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
„ „	Pivot	16.00	..	..	..	..	16.00	..	..	..	..	..	18 10 0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
Sulphate of Ammonia	M.G. Co. in diamond	..	20.59	..	..	..	20.59	..	..	..	..	..	18 10 0	The Metropolitan Gas Co., 196 Flinders-st., Melbourne
	Pivot	..	20.60	..	..	..	20.60	..	..	..	..	..	18 10 0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
	Sickle in diamond	..	20.60	..	..	..	20.60	..	..	..	..	..	18 10 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
	Cresco	..	20.60	..	..	..	20.60	..	..	..	..	..	18 10 0	Cresco Fertilizers Ltd., Geelong
	T.B. & S. in diamond—Brooklyn	..	..	12.00	..	..	12.00	..	..	..	..	..	12 0 0	Thos. Borthwick and Sons (A/asia) Ltd., 34 William-st., Melbourne
„ „	T.B. & S. in diamond—Portland	..	..	12.00	..	..	12.00	..	..	..	..	..	12 0 0	Thomas Borthwick and Sons (A/asia) Ltd., 34 William-st., Melbourne
„ „	M.C.C. in diamond	..	..	12.00	..	..	12.00	..	..	..	..	..	13 3 9	Melbourne City Council, Town Hall, Melbourne
„ „	Champion	..	..	13.00	..	..	13.00	..	..	..	..	..	13 0 0	Sims Cooper (Freezing Works) Pty. Ltd., 31 Queen-st., Melbourne

**LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE
FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1948—continued.**

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Sulphate.	Price asked per ton.*	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
<i>Moderately Available—continued.</i> Blood Manure ..	Dandy ..	..	..	10.50	..	..	10.50	..	..	..	..	..	10 0 0	Gippsland Co-op. Bacon Curing Co. Ltd., Dandenong
„ „ ..	Vima ..	..	..	11.00	..	..	11.00	..	..	..	..	..	11 0 0	Victorian Inland Meat Authority, 54 Market-street, Melbourne
„ „ ..	Pentagon ..	..	..	8.13	..	..	8.13	..	2.07	1.13	3.20	..	9 0 0	Mulgrave By-Products Co., North-rd., East Oakleigh
<i>Slowly Available.</i> Castor Meal ..	Alba ..	..	..	..	..	..	4.50 (as castor meal)	..	..	2.25	2.25	.75	4 5 0	Lycett Proprietary Ltd., Normanby-rd., Montague
Rape Seed Meal	Alba ..	..	..	..	..	..	5.50 (as rape seed meal)	..	..	1.75	1.75	1.50	5 5 0	„ „ „
		As Flesh, Hoof, and Treated Leather												
Flesh, Hoof, and Treated Leather	No. 3 Fertillo	8.00	..	..	..	..	8.00	..	..	..	..	..	8 0 0	Glues and By-Products Pty. Ltd., 86 King-st., Melbourne
<i>Phosphatic—Readily Available.</i> Superphosphate—21 per cent...	Sickle in diamond	..	..	..	..	..	..	17.00	2.50	1.50	21.00	..	6 3 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
„ „ ..	Pivot ..	..	..	..	..	..	..	17.00	2.50	1.50	21.00	..	6 3 0	Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
„ „ ..	Cresco ..	..	..	..	..	..	..	17.00	2.50	1.50	21.00	..	6 3 0	Cresco Fertilizers Ltd., Geelong
<i>Phosphatic—Moderately Available.</i> Basic Super. reverted	Sickle in diamond	..	..	..	..	..	..	..	14.7	3.20	17.90	..	6 18 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
„ „ ..	Pivot ..	..	..	..	..	..	..	..	14.4	3.20	17.60	..	6 18 0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
<i>Potassic—Readily Available.</i> Sulphate Potash of	Pivot ..	..	..	..	..	..	..	..	..	..	..	48.50	22 10 0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
„ „ ..	Sickle in diamond (90%)	..	..	..	..	..	..	..	..	..	..	48.50	22 10 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
Muriate Potash of	Sickle in diamond (80%)	..	..	..	..	..	..	..	..	..	..	50.00 (as chloride)	20 0 0	„ „ „
„ „ ..	Pivot ..	..	..	..	..	..	..	..	..	..	..	50.00 (as chloride)	20 0 0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne

**LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE
FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1948—continued.**

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Unspecified.	Price asked per ton.*	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
<i>Potassic— Readily Available— continued.</i>														
Potash Salts (mainly sulphate)	A.P.C.	..	..	..	..	..	..	..	..	..	..	45.00 (un-specified)	22 0 0	Australian Portland Cement Pty. Ltd., 422 Collins-st., Melbourne
MIXED FERTILIZERS.														
<i>Containing Nitrogen and Phosphoric Acid— Readily Available.</i>														
Super. and Ammonia	Cresco (3 and 1)	..	5.00	..	..	..	5.00	12.80	1.80	1.20	15.80	..	10 4 6	Cresco Fertilizers Ltd., Geelong
" "	Cresco (6 and 1)	..	2.90	..	..	..	2.90	14.60	2.10	1.30	18.00	..	8 16 0	" " "
" "	Cresco (2 and 1)	..	6.80	..	..	..	6.80	11.30	1.70	1.00	14.00	..	11 6 0	" " "
" "	Pivot II. (3 and 1)	..	5.00	..	..	..	5.00	12.70	1.80	1.20	15.70	..	10 4 6	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
" "	Pivot I. (6 and 1)	..	2.90	..	..	..	2.90	14.60	2.10	1.30	18.00	..	8 16 0	" " "
" "	Sickle in diamond (3 and 1)	..	5.00	..	..	..	5.00	12.80	1.80	1.20	15.80	..	10 4 6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
" "	Sickle in diamond (6 and 1)	..	2.90	..	..	..	2.90	14.60	2.10	1.30	18.00	..	8 16 0	" " "
" "	Sickle in diamond (2 and 1)	..	6.90	..	..	..	6.90	11.30	1.70	1.00	14.00	..	11 6 0	" " "
Nitro Super-phosphate	Sickle in diamond	..	1.50	..	..	0.50	2.00	14.60	2.60	1.80	19.00	..	8 13 3	" " "
" "	Cresco	..	1.50	..	..	.50	2.00	14.10	2.70	2.40	19.20	..	8 13 3	Cresco Fertilizers Ltd., Geelong
<i>Moderately Available.</i>														
Blood, Bone, and Super.	Sickle in diamond	..	..	..	..	2.50	2.50	11.30	4.10	3.40	18.80	..	8 16 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
Bone and Super.	Sickle in diamond, No. 1	..	..	..	..	2.00	2.00	10.20	4.20	5.60	20.00	..	8 14 9	" " "
" "	Cresco No. 1	..	..	..	..	2.00	2.00	9.70	4.00	6.00	19.70	..	8 14 9	Cresco Fertilizers Ltd., Geelong
Super. and Bone	Cresco No. 2	..	..	..	..	1.00	1.00	14.30	3.10	2.30	19.70	..	8 4 0	" " "
" "	Sickle in diamond, No. 2	..	..	..	..	1.00	1.00	14.70	3.10	2.30	20.10	..	8 4 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
<i>Containing Phosphoric Acid and Potash— Readily Available.</i>														
Super and Potash	Sickle in diamond	..	..	..	..	..	..	12.80	1.80	1.20	15.80	11.20 (un-specified)	11 2 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
" "	Pivot 9 (3 and 1)	..	..	..	..	..	..	12.70	1.80	1.20	15.70	12.50 (un-specified)	11 2 0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
" "	Cresco (3 and 1)	..	..	..	..	..	..	12.80	1.80	1.20	15.80	11.25 (un-specified)	11 2 0	" " "
<i>Nitrogen— Slowly Available.</i>														
Flesh, Hoof, and Treated Leather with Bone	Fertililo Mixed No. 4	5.55	..	..	..	..	5.75	..	4.00	6.00	10.00	..	8 0 0	Glues and By-Products Pty. Ltd., 86 King-st., Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE
FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1948—continued.

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Unspecified.	Price asked per ton.*	Where Obtainable.*
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
MIXED FERTILIZERS—continued.														
Nitrogen—Slowly Available—continued.														
Flesh, Hoof, and Treated Leather with Bone	Pannifex's (G)	4.75	..	1.50 (as bone)	..	..	6.25	..	7.25	6.25	13.50	..	9 12 6	H. C. Pannifex and Co. Pty. Ltd., 53-57 Munster-terrace, North Melbourne
Flesh, Hoof, and Treated Leather with Bone and with Super.	Fertillo Mixed No. 2	5.55	..	.20 (as bone)	..	..	5.75	2.0	2.0	6.0	10.00	..	8 0 0	Glues and By-Products Pty. Ltd., 86 King-st., Melbourne
ANIMAL FERTILIZERS.														
Containing Nitrogen and Phosphoric Acid—Moderately Available.														
Blood and Bone	J. A. Dundas..	..	..	..	..	4.50	4.50	..	7.14	13.61	20.75	..	9 13 9	J. A. Dundas, Dynon-rd., Footscray
" "	Corio ..	..	..	..	..	4.00	4.00	..	5.00	10.00	15.00	..	8 0 0	The Corio Trading Co. Pty. Ltd., 164 Moorabool-st., Geelong
" "	Fitzroy Special	..	..	..	..	5.00	5.00	..	13.00	5.00	18.00	..	9 10 0	W. Angliss and Co. (Aust.) Pty. Ltd., 42 Bourke-st., Melbourne
" "	Murray ..	..	..	..	..	5.75	5.75	..	4.50	7.50	12.00	..	8 15 0	Western and Murray Co-operative Bacon and Meat Packing Co. Ltd., 522 Flinders-lane, Melbourne
" "	Pridham's ..	..	..	..	..	5.00	5.00	..	6.00	8.00	14.00	..	8 10 0	W. Pridham Pty. Ltd., Evans-st., Braybrook
" "	P.M. ..	..	..	..	..	7.00	7.00	..	9.00	5.00	14.00	..	10 10 0	J. Kitchen and Sons Pty. Ltd., Ingles-st., Port Melbourne
" "	Solo ..	..	..	..	..	7.00	7.00	..	9.00	5.00	14.00	..	10 10 0	Sims, Cooper (Freezing Works) Pty. Ltd., 31 Queen-st., Melbourne
" "	Champion ..	..	..	..	..	7.00	7.00	..	3.50	4.50	8.00	..	9 0 0	P. Fitzgerald and Sons Pty. Ltd., Warrigal-rd., Oakleigh
" "	Fitzgerald's ..	..	..	..	..	5.00	5.00	..	8.50	6.50	15.00	..	8 15 0	Thos. Borthwick and Sons (A'asia) Ltd., 84 William-st., Melbourne
" "	T.B. and S. in diamond (Portland)	..	..	..	..	6.00	6.00	..	7.00	5.00	12.00	..	9 0 0	" " "
" "	T.B. and S. in diamond (Brooklyn)	..	..	..	..	6.00	6.00	..	7.00	5.00	12.00	..	9 0 0	" " "
" "	T.B. and S. in diamond No. 2 (Brooklyn)	..	..	..	..	4.50	4.50	..	7.00	11.00	18.00	..	9 0 0	" " "
" "	Apex ..	..	..	..	..	4.50	4.50	..	7.00	9.00	16.00	..	8 10 0	North-Eastern Bone Products, Wangaratta
" "	Pannifex's (C)	..	..	..	..	5.00	5.00	..	6.00	8.00	14.00	..	8 10 0	H. C. Pannifex and Co. Pty. Ltd., 53-57 Munster-terrace, North Melbourne
" "	Arch ..	..	..	..	..	5.50	5.50	..	9.00	7.00	16.00	..	9 10 0	Victorian Inland Meat Authority, 54 Market-st., Melbourne
" "	Pentagon ..	..	..	..	..	5.61	5.61	..	8.64	8.25	16.89	..	9 15 0	Mulgrave By-Products Co., North-road, East Oakleigh
" "	Sayer ..	..	..	..	..	4.25	4.25	..	8.85	9.90	18.75	..	9 0 0	Sayer and Co. Inc., Laver-ton
Animal Fertilizer	A and A Surprise	..	..	..	..	5.00	5.00	..	4.00	10.00	14.00	..	9 10 0	G. W. Pennell (dec'd.), Burke-st., Braybrook
Bone Fertilizer	Valley ..	..	..	..	..	7.70	7.70	..	3.30	2.80	6.10	..	9 5 0	Chas. Cowley and Co. (Aust.) Pty. Ltd., P.O. Box 124, Shepparton

**LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE
FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1948—continued.**

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Unspecified.	Price asked per ton.*	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
COMPLETE FERTILIZERS.		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Containing Nitrogen, Phosphoric Acid, and Potash—Readily Available														
Complete Fertilizer	Sickle in diamond (Market Garden) No. 2	..	3.10	..	..	.75	3.85	11.80	2.40	1.80	16.0	2.20	10 16 9	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
"	Sickle in diamond (A) (5.1.1)	..	2.90	..	..	..	2.90	12.10	1.80	1.10	15.00	6.40	11 11 0	" " "
"	Sickle in diamond (B) (5.2.1)	..	5.00	..	..	..	5.00	10.60	1.60	.90	13.10	5.60	12 15 0	" " "
"	Sickle in diamond (C) (4.4.1)	..	9.15	..	..	..	9.15	7.50	1.10	.70	9.30	5.00	15 3 0	" " "
"	Sickle in diamond (D) (2.2.1)	..	8.20	..	..	..	8.20	6.80	1.00	.60	8.40	9.00	15 19 0	" " "
"	Pivot IV. (5.1.1)	..	2.90	..	..	..	2.90	12.10	1.80	1.10	15.00	6.90	11 11 0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
"	Pivot V. (2.2.1)	..	8.20	..	..	..	8.20	6.80	1.00	.60	8.40	9.70	15 19 0	" " "
"	Pivot VI. (4.4.1)	..	9.10	..	..	..	9.10	7.50	1.10	.70	9.30	5.30	15 3 0	" " "
"	Cresco No. 1 (5.1.1)	..	2.90	..	..	..	2.90	12.10	1.80	1.10	15.00	6.43	11 11 0	Cresco Fertilizers Ltd., Geelong
"	Cresco, No. 2 (4.4.1)	..	9.15	..	..	..	9.15	7.50	1.10	.70	9.30	5.00	15 3 0	" " "
"	Cresco, No. 3 (5.2.1)	..	5.15	..	..	..	5.15	10.60	1.60	.90	13.10	5.63	12 15 0	" " "
"	Cresco No. 4 (2.2.1)	..	8.20	..	..	..	8.20	6.80	1.00	.60	8.40	9.00	15 19 0	" " "
"	Rapid Grower	..	1.67	..	1.33 (as organic manure)	..	3.00	..	3.00	3.00	6.00	2.00	6 10 0	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
"	Pinnacle	..	1.70	..	1.50	..	3.20	8.50	3.70	3.10	15.30	2.42	9 7 6	" " "

Description of Fertilizer.	Brand.	Nitrogen as Bone.	Phosphoric Acid.	Mechanical Condition.		Price asked per ton.*	Where Obtainable.
				Fine Bone.	Coarse Bone.		
Bonedust	Apex	3.25	20.00	50.0	50.0	8 5 0	North-Eastern Bone Products, Wangaratta
"	Mount Clear	3.00	19.00	50.0	50.0	7 15 0	Bailey Bros., Mount Clear, via Ballarat
"	Pannifex	2.50	26.00	50.0	50.0	9 0 0	H. C. Pannifex and Co. Pty. Ltd., 53-57 Munster-terrace, North Melbourne
"	Fertillo	1.00	32.50	95.0	5.0	9 2 6	Glues and By-Products Pty. Ltd., 86 King-street, Melbourne
"	T.B. and S. in diamond Brooklyn	2.50	24.0	50.0	50.0	8 10 0	Thos. Borthwick and Sons A/asia Ltd., 84 William-street, Melbourne
"	T.B. and S. in diamond Portland	2.50	24.00	50.0	50.0	8 10 0	" " " " " "
"	VIMA	5.00	20.00	62.0	38.0	10 0 0	Victorian Inland Meat Authority, 54 Market-street, Melbourne
"	Bendigonian	3.75	23.16	62.0	38.0	9 10 0	Bendigo Fertilizer and Wool Co. Pty. Ltd., Charing Cross, Bendigo
"	Hortico	3.90	22.25	50.0	50.0	9 10 0	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond

* F.O.R. at Melbourne or Railway Station nearest place of manufacture.

Melbourne, 2nd December, 1947.

W. R. JEWELL, M.Sc., F.R.I.C.,
Chemist for Agriculture.

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PASTURE INVESTIGATIONS *in the* WESTERN DISTRICT



Extracts from the 1946-47 Annual Report of the Department of Agriculture to the Victorian Pasture Improvement League.

By R. J. Newman, B.Agr.Sc., Assistant Agrostologist

THE problem of improving soil fertility in the Western District is mainly one of supplementing soil phosphate with phosphatic fertilizers, but, in certain areas, potash and lime are also needed, and in some of the coastal districts the minor element copper is deficient.

Throughout the Western District, potash in the soil is in short supply, and, under exhaustive farming practices, a deficiency readily occurs. Repeated cropping or regular mowing of paddocks and removal of fodder for conservation elsewhere, coupled with the present system of dairy farm management, is almost certain to induce potash deficiency in a relatively short time.

Dairy farmers would be well advised to modify their system of management, and to make fuller use of farmyard manure, which is a valuable source of soil fertility normally wasted around the cowshed. In some areas, such as Cashmore and Ardno, the

deficiency of potash is so acute on some of the sandy soils that the application of potassic fertilizer appears to be necessary before a well-balanced perennial pasture can be grown. It is probable that the good response to potassic fertilizer throughout the Western District during 1946 was associated with the heavy demands upon soil fertility brought about by good seasonal conditions.

Lime gives a marked response in some areas where heavy applications are used. The development of pasturage on poor scrub land at Cooriemungle has been greatly assisted by a basal dressing of lime. However, under no circumstances can lime be regarded as a substitute for superphosphate, and it is necessary to apply phosphatic fertilizers as well.

While the basic constituents of a good pasture in the Western District are perennial rye grass and subterranean clover, more



A mixed pasture of *phalaris tuberosa* and subterranean clover suitable for areas in the Western District which are too dry for perennial rye grass.

phosphate and sowing subterranean clover. After a few years of topdressing, however, this pasture becomes subterranean clover dominant, and is unbalanced from a feeding viewpoint. A further step should be taken to introduce perennial types of grasses. Perennial rye grass does not persist for long, except in the heavy types of soils and a more drought-resistant and deeper-rooting plant, such as *phalaris tuberosa*, could be included with advantage in any scheme of pasture improvement.

Buckley—J. Steele

Average rainfall (Winchelsea) 20.5 inches. Soil type—brown-grey clay loam with small ironstone concretions. (pH =

5.3.)

Superphosphate has given a marked progressive response when applied at the rates 90 lb. to 360 lb./ac., but the extra response when more than 180 lb. is applied, is small. Responses to basic superphosphate and rock phosphate have been poorer than superphosphate applied at the same rate.

A small response to lime applied at 1 ton/ac. and dolomite 1 ton/ac. continues to be evident. This is indicated by the stronger development of annual grasses—particularly barley grass—on these strips and the stronger establishment of subterranean clover.

Another interesting feature showing this year, was that after a heavy grazing in October the pasture on the potash strips came away more quickly than on the rest of the plot. Subterranean clover flourishes in this area, and perennial rye grass holds fairly well except in the dry years. *Phalaris tuberosa* would be a more permanent grass.

Cobrico—N. Maskell

Average rainfall (Terang) 29.77 inches. Soil type—grey, fine, sandy loam. (pH = 5.6.)

attention could be given to the inclusion of such species as cocksfoot, *phalaris*, and possibly *paspalum*. Cocksfoot would be suited to the coastal belts where summer rainfall is better, and *phalaris* could be used to advantage in the drier areas.

Apsley—J. W. Reader

Average rainfall 23.95 inches. Soil type—brown-grey sandy loam, overlying yellow clay at 30 inches. (pH = 5.7.)

During the first year the Apsley plot has shown a good progressive response to increasing dressings of superphosphate up to 4 cwt./ac. Potash at the rate of 1 cwt., when applied with superphosphate 2 cwt., has given a small improvement, but the response is not as good as an extra 2 cwt. of superphosphate.

Lime has shown no positive improvement so far. Rock phosphate and basic superphosphate have given small responses, but are not as good as the same dressings of superphosphate.

No responses to the minor elements, copper, zinc, manganese, boron, and molybdenum have been evident during the year.

One stage of pasture improvement can easily be achieved in this district by the topdressing of native pastures with super-

Cobrico plot was established in 1932, and now consists of a grazing man-
 urial trial and a sown-
 species section. There has
 been a marked response
 to potassic fertilizer and
 superphosphate, whereas
 superphosphate alone has
 given relatively poor re-
 sults on this plot.

Although the results
 from potash, 1 cwt./ac.,
 were good, once the potash
 is withheld the residual
 effect quickly diminishes,
 and disappears entirely
 after five years, and it
 would appear that fre-
 quent dressings are neces-
 sary to maintain a vigorous
 pasture.

Lime used in conjunction with super-
 phosphate and potash has given quite a
 good response; the response to lime and
 super. without potash has been fair, the
 pasture being more closely grazed, with a
 higher percentage of sub. clover in the sward
 than in the "superphosphate alone" paddock.

On the farm, excellent results from
 applying farmyard manure could be seen,



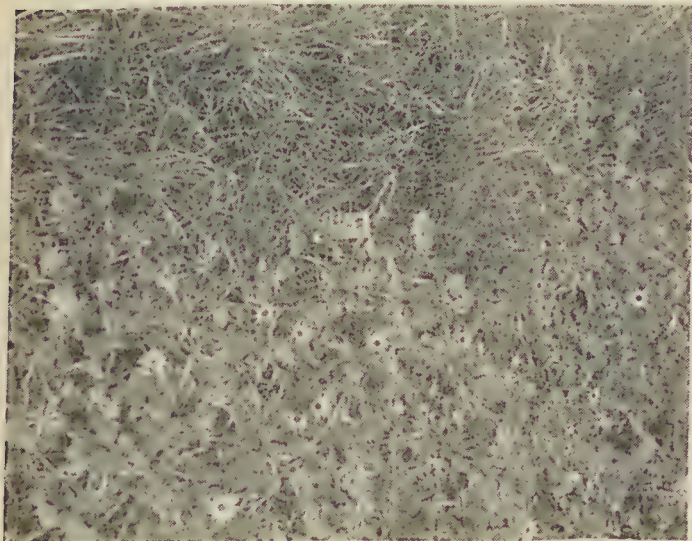
A pasture deficient in potash becomes weedy and lacks vigour. Treatment
 with farmyard manure is very effective in treating this class of pasture.

and its application would obviate the ne-
 cessity for heavy annual dressings of potash.

The sown-species trial on this farm shows
 perennial rye grass and subterranean clover
 to be the basic species for improved pas-
 tures in this area, but the mixture of
 phalaris, paspalum, and cocksfoot improves
 the palatability, and it is then more uni-
 formly grazed through the year.

Phalaris has an added ad-
 vantage because of its resist-
 ance to the attacks of cock-
 chafer grubs, but it will not
 stand competition from rye
 grasses in the first years of
 establishment, and should not
 be sown with it. Once the
 phalaris is firmly established,
 perennial rye grass can then
 be introduced by top sowing.

One noticeable feature in
 this district during the past
 year, was the apparent in-
 crease in sweet vernal and fog
 grasses. This was probably
 due to the excessive wetness.
 Normally, these grasses will
 not compete with better species
 if soil fertility is kept high
 and proper attention is given
 to grazing management.



Capeweed will not invade a closed sward of perennial species,
 but flourishes among subterranean clover.



Sowing pasture seed on the ash after a burn is one method of establishing pasture in the Heytesbury forest country. Liberal top-dressing with superphosphate and proper management is essential to maintain it in a vigorous condition.

Cudgee—E. R. Murfitt

Average rainfall (Allansford) 29.09 inches. Soil type—brown-grey, fine, sandy loam. (pH = 5.5.)

During the past fifteen years paddocks in one section of the trial have been consistently topdressed with superphosphate at the rate of 2 cwt. per acre, and these paddocks continue to support a good type of pasture composed of perennial rye grass, cocksfoot, and subterranean clover.

The untreated paddock has steadily declined in productivity, and deteriorated in botanical composition, but subterranean clover remains, and is now admixed with native grasses, fog, and bent grasses. After a second application of lime at the rate of 1 ton/ac. in 1943, a marked response to lime showed up in the spring of 1945. During the past year, the lime response was not very evident, except where lime, potash, and superphosphate had all been applied.

On one section of the grazing manurial trial where potassic fertilizer has been regularly applied at the rate of 1 cwt./ac., little or no benefit could be seen until the paddock had been mown for two years in succession. A response to potash was still evident in 1946, and, as a deficiency can be so readily induced after applying such a liberal amount of potash in the past, it indicates that great care should be exercised in the selection of paddocks for fodder conservation in this district.

The trial of various pasture plants at this centre has shown that perennial rye grass, subterranean clover, phalaris tuberosa, cocksfoot, paspalum, and kikuyu grasses are well suited to the environmental conditions at Cudgee.

Capeweed can be troublesome in improved pastures, but it has been demonstrated in the trial at Cudgee that a dense sward of grasses excludes most annual weeds. Such dense sward-forming grasses as cocksfoot, phalaris, paspalum, associated with

perennial rye grass could be included in any programme of sowing down.

Pirron Yallock—G. Howey

Average rainfall (Tomahawk Creek) 31.74 inches. Soil type—brown-grey clay loam. (pH = 5.8.)

The trial on this property was established in 1939 to investigate the effect of using various fertilizers and lime on depleted pasture being used for dairy farming. Little or no response to superphosphate has been evident this year, the amount of potassium in the soil being the limiting factor. Pastures on the superphosphate alone paddocks have been weedy and without vigor, but, where superphosphate and potash have been applied, a vigorous sward of subterranean clover and rye grass has developed. Lime applied at the rate of 1 ton/ac. has not been a corrective for potash deficiency.

While the pasture has become progressively better with increasing amounts of potash applied, heavy dressings at the present market price would be uneconomic, but potash at the rate of $\frac{1}{2}$ cwt. applied with superphosphate could be economically used in this area.

Owing to heavier demands on the soil due to the very good year, and probably the extra losses due to leaching during the wet winter, demands on soil potash have been heavier than in normal seasons,

and this has been reflected on the plot where the heavy dressing of potash has given a relatively better response than in other years.

During the past year the residual effect of the cement ash treatment was negligible. This material was applied at the rate of $\frac{1}{2}$ ton/ac. (equivalent to 2 cwt. muriate of potash) in 1939.

Garvoc—T. C. Blain

Average rainfall (Terang) 29.77 inches. Soil type—brownish-grey clay loam. (pH = 5.4.)

Superphosphate and potash have given good results on this plot. The responses to Nauru rock phosphate and basic superphosphate have been inferior to superphosphate, and neither lime 1 ton nor dolomite 1 ton/ac. has given any significant improvement.

The land at Garvoc is representative of quite a wide belt of country in this area, and, while it responds well to superphosphate, it needs careful management to avoid depletion of soil fertility.

Timboon—A. W. Gray

Average rainfall 36.71 inches. Soil type—grey sandy loam overlying yellow clay rubble. (pH = 5.4.)

The land on which this plot is situated is representative of some of the poorer types in the district where pastures develop slowly despite liberal topdressing with superphosphate. Quite good results have been obtained from superphosphate and potassic fertilizer. Basic superphosphate and rock phosphate have given results inferior to superphosphate.

During the past year the limed strips were no better than the others. In previous years lime has depressed growth, and, during the spring of 1945, a marked response to copper used at 10 lb./ac. was seen, but no response was evident during the spring of 1946.

Molybdenum compound applied at the rate of 4 oz./ac. has shown no improvement whether applied in the autumn or spring.



A vigorous stand of strawberry clover and perennial rye grass on Panmure flats. This mixture was sown after cultivation to kill weed growth and tussocks.

Bochara—J. E. Chadderton

Average rainfall (Hamilton) 26·98 inches. Soil type—brown-grey loam to clay loam with odd iron concretions and weathered rock fragments. (pH = 5·5.)

The soil at Bochara is very responsive to applications of superphosphate. At present, however, very little additional benefit can be obtained with applications in excess of 180 lb./ac.

Both basic superphosphate and finely-ground rock phosphate are inferior to superphosphate.

Neither lime 1 ton/ac. nor dolomite 1 ton/ac. has given any visible response.

A marked response to potash 180 lb./ac. was first evident in the early spring of 1945, but, during 1946, was not so conspicuous.

Dean's Marsh—G. Atkins

Average rainfall (Penny Royal) 30·72 inches. Soil type—brown-grey loam. (pH = 5·4.)

Superphosphate has given good results in this area, and on the plot potassic fertilizer has given a fair response.

No improvement has been observed from application of lime or dolomite at 1 ton/ac.

Basic superphosphate has been inferior to superphosphate, and the response to rock phosphate has been poor.

While superphosphate is the key to pasture improvement in this area, the limited reserves of potash in the soil indicate that discretion must be exercised in the management of paddocks reserved for fodder conservation.



Pasture harrowing to spread dung patches would prevent this development of rank, unpalatable growth.

Penshurst—W. Underwood

Average rainfall 27·23 inches. Soil type—dark-brown clay loam with odd iron concretions. (pH = 5·6.)

Although good results have been obtained on the plot from using superphosphate and potash, the history of the paddocks reveals exhaustive treatment in the past, and similar land in the district may not show such a spectacular response unless similarly treated. It does, however, serve as a warning that reserves of potash are not great, and care must be exercised in farm management to conserve soil fertility.

The results from basic superphosphate and rock phosphate have been small. One feature which was evident during the spring of 1946 was the better and more uniform development of clover through the sward on the strips treated with phosphatic fertilizer of low availability by comparison with those receiving heavy dressings of superphosphate.

Neither lime nor dolomite has given any appreciable improvement when applied at the rate of 1 ton/ac.

Port Fairy—J. C. Goldie

Average rainfall 29·04 inches. Soil type—black medium clay. (pH = 6·3.)

Features of the Port Fairy district are the calcareous banks with the heavy flats between. While the banks support pastures dominated by annual grasses and various species of medicks, the flats carry strong perennial pastures of perennial rye grass, strawberry and white clovers, cocksfoot, and Kentucky blue grass.

The experimental plot situated on a heavy, black, clay soil has shown only a small response to superphosphate. In previous years a small response to potassic fertilizer has shown up, but during this year, the potash did not show up to any appreciable extent. The plot had been very wet during the autumn and winter, being for some time completely under water.



Improved pasture provides a large surplus of herbage for conservation.

Lime showed no improvement during 1946, nor was there any response to the minor elements, copper, zinc, boron, manganese, magnesium, or molybdenum.

Noorat—Mrs. I. Black

Average rainfall (Terang) 29.77 inches. Soil type—brown clay loam overlying weathered rock fragments. (pH = 6.1.)

This soil represents a very limited area, and is exceedingly rich in plant food. No responses to any fertilizer or lime treatment have shown up, nor do stock show any preferential treatment for any particular strip.

The normal pasture which develops is dominated by annual clovers and medicks, such as Spotted Medick (*Medicago arabica*), annual species of grasses, and high-fertility weeds. Lucerne grows vigorously on this type of soil, and there are several excellent fields nearby.

Rickett's Marsh—A. Whytecross

Average rainfall 25.72 inches. Soil type—dark-grey light clay. (pH = 5.7.)

Superphosphate has given a fair response on this plot, but the best results have been obtained where superphosphate 180 lb./ac. and lime 1 ton/ac. have been applied together. None of the other common fertilizers have given any results. Molybdenum

compound at the rate of 4 oz./ac. has shown no visible improvement. This soil represents approximately 4,000 to 5,000 acres in this area.

Perennial rye grass and strawberry clover are the most prominent pasture plants on this heavy black soil.

Sisters—D. McRae—TRIAL No. 1.

Average rainfall (Mortlake) 26.33 inches. Soil type—brownish-grey sandy loam. (pH = 5.3.)

The results at the Sisters are similar to those obtained at Garvoc except that the response to potash has been greater. The potash strips have supported an excellent sward of vigorous subterranean clover and perennial rye grass.

The marked deficiency of potash on this soil is limiting the results from superphosphate. This indicates the wisdom of using liquid manure on pastures and the need for careful selection of paddocks for meadow hay.

Neither lime nor dolomite at the rate of 1 ton/ac. have improved the response to superphosphate, but a slight improvement was noticeable when lime was used in conjunction with superphosphate and potash.

Rock phosphate and basic superphosphate have given poor results and are not as good as superphosphate.

Sisters—D. McRae—TRIAL No. 2.

Average rainfall (Mortlake) 26·33 inches.

This trial was laid down in the autumn of 1946 and includes the following treatments:—Nil; Superphosphate $\frac{1}{2}$ cwt.; superphosphate 1 cwt.; superphosphate $\frac{1}{2}$ cwt. plus potash $\frac{1}{4}$ cwt.; superphosphate $\frac{1}{2}$ cwt. plus potash $\frac{1}{2}$ cwt.; superphosphate 1 cwt. plus potash $\frac{1}{4}$ cwt.; superphosphate 1 cwt. plus potash $\frac{1}{2}$ cwt.

The purpose of this trial is to find out if rates of potash less than 1 cwt./ac. would give a good response, and further, to give a guide to the most economical dressing to use.

The results for the first year have indicated that good results can be obtained by using potash at as low as $\frac{1}{4}$ cwt./ac. provided that superphosphate is applied at not less than 1 cwt./ac.

It appears that the phosphate requirement of the soil must be satisfied before the potash can fully express itself.

Cooriemungle (Prison Camp)—TRIAL No. 1.

1946 rainfall 40·74 inches. Soil type—grey sandy, acidic soil with a large amount of undecomposed organic matter. (pH = 5·1.)

This trial, laid down in 1944 on poor-type "Yacca" country, has shown that while an excellent strike of sown species can be obtained after ploughing and burning the sod, there are mechanical difficulties with sowing after this treatment. Sowing after a burn without cultivation gave rather indifferent results, and the regrowth of scrub was rapid.

Superphosphate has shown a good response, and while lime has shown an improvement, no response to potassic fertilizer has been evident. It should be noted that the land received a good dressing of ashes before the fertilizer and lime were applied.

An application of copper sulphate at the rate of 10 lb./ac. gave a marked response, particularly the subterranean clover.

Cooriemungle (Prison Camp)—TRIAL No. 2.

1946 rainfall 40·74 inches.

Superphosphate has shown a progressively better response with heavy dressings up to 8 cwt./ac. White, red, and subterranean

clovers are making fair growth on these strips, but the main grass up to date is fog grass. Lime at the rate of 10 cwt./ac. has given a marked response, improving both the vigour and density of the subterranean clover in the sward. Responses to rock phosphate, serpentine superphosphate, and basic superphosphate have been poor. As yet no definite response to minor elements can be seen.

Heathmere—F. Meagher

Average rainfall (Heywood) 32·59 inches. Soil type—dark, grey sandy, loam. (pH = 5·6.)

A good response to superphosphate has been evident on this plot, but a marked response to potash which had previously shown up, was not conspicuous during 1946 except during the springtime.

Lime applied at the rate of 10 cwt./ac. has not shown any improvement as yet.

Up to the present no definite responses to copper have been observed on the plot. Other minor elements, such as zinc, and molybdenum have given no improvement to date.

Heywood—S. Quayle

Average rainfall 32·59 inches. Soil type—45 WD. 18—brown-grey clay loam. (pH = 5·9.) 45 WD. 19—brown loam with iron stone conerctions. (pH = 5·7.)

Earlier trials on the grey clay loam gave good results with superphosphate and lime, but further trials with molybdenum, zinc, boron, magnesium, and manganese have so far not given any positive results. No response to copper has been evident on either plot.

Ardno—R. McEachern

Average rainfall (Puralka) 28·46 inches. Soil type—light, sandy loam, overlying lime-stone clay at a depth of about 3 ft. 6 in.

The soil type upon which the plot is situated represents a large tract of country in that district. A good response to superphosphate has been obtained in the first year. Lime 10 cwt./ac. has not shown up to any advantage, but potassic fertilizer at the rate of 1 cwt./ac. has caused a marked improvement both in the vigor and density of the subterranean clover present in the sward.

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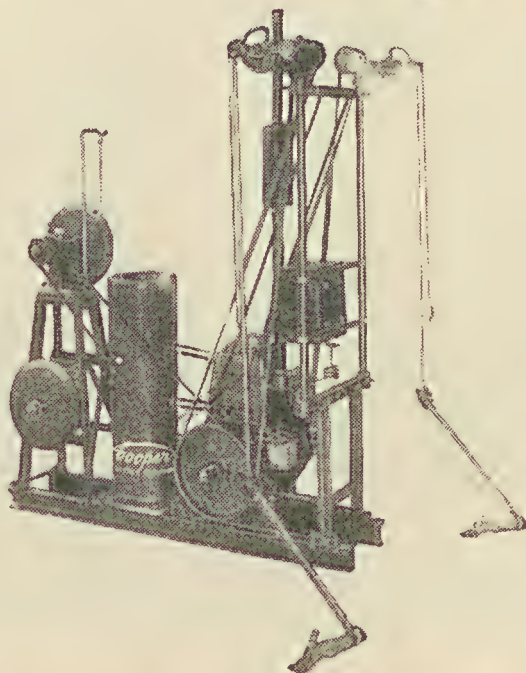
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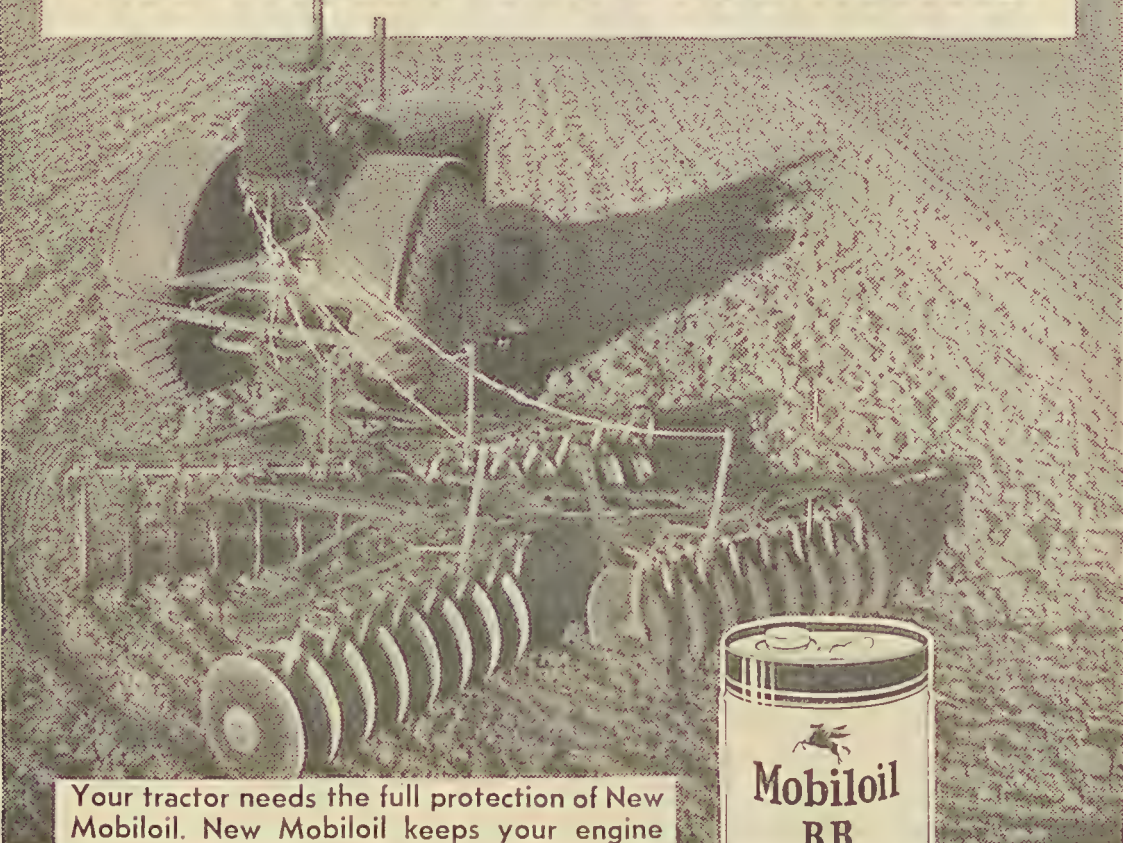
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Surplus herbage can be ensiled in pits and used during times of scarcity.

Rock phosphate and basic superphosphate have given only poor responses.

As yet no responses have been observed to the minor elements copper, zinc, boron, manganese, and molybdenum.

Cashmore—V. Anthony

Average rainfall (Gorae) 37.87 inches. Soil type—grey sandy loam. (pH = 5.6.)

During the first year of establishment of this plot, a good response to superphosphate has been obtained. Lime 10 cwt./ac. has not given any further improvement, but potash at the rate of 1 cwt./ac. has evoked a marked response.

No responses to minor elements have been evident to date, although there is evidence of coastal disease among young stock in this area.

The main pasture in this area consists mostly of fog grass and lotus spp. Perennial rye grass and white clover do well on the heavier types of soil, and there are some excellent pastures of this type in the district. However, on the lighter soils, rye grass does not appear to persist until the soil fertility has been raised. One of the major problems in this area is to establish subterranean clover.

Caramut—C. C. Kelly

Average rainfall 23.75 inches. Soil type—brown clay loam with fragments of rock overlying a yellowish clay at 14 inches. (pH = 5.5.)

The purpose of this trial is to find out the best method of introducing phalaris into an improved pasture of subterranean clover and perennial rye grass. This phalaris establishment trial was commenced in 1946 when two paddocks were ploughed up and cropped with oats for hay. Owing to the wet season the oat crop was only fair. There appeared to be a good kill of subterranean clover and rye grass following the late cultivation, and it would appear that these species would now not offer any serious competition when the phalaris is sown.

Rokewood—R. Walton

Average rainfall 21.86 inches. Soil type—brownish clay loam overlying brown clay at 12 inches.

The district is marginal to rye grass and *phalaris tuberosa* would be a desirable perennial species to sow. A phalaris establishment trial on native unimproved grassland was laid out and portion fallowed during 1946. Various methods of sowing *phalaris tuberosa* will be undertaken during 1947.

Agricultural Lime—Brands Registered for 1948

THE list of brands of agricultural lime registered for 1948, under the provisions of the *Agricultural Lime Act 1934*, is given below. It will be remembered that the Act requires the manufacturer to register each brand of lime he sells, and that it is an offence to sell an unregistered brand. The list is practically the same as for last year, except for an increase in price in most cases, granted by the Prices Branch because of increased costs.

Agricultural lime, for the purposes of the Act, is burnt lime (calcium oxide), slaked lime (calcium hydrate), or ground limestone (calcium carbonate), sold or intended to be used for application to the soil. The significance of the various types

of lime and their value for agricultural purposes are described in a leaflet on the use of agricultural lime, available free on application.

Farmers should be sure that all lime purchased is labelled showing the brand, name and address of the manufacturer, weight and guaranteed analysis. The analysis should state the percentages of calcium and magnesium oxides (and the forms in which they are present) and the percentage passing through a 20-mesh sieve; degree of fineness is of some importance.

Any inquiries relating to agricultural lime will be welcomed and should be addressed to the Chemist for Agriculture, State Laboratories, Melbourne.

LIST OF AGRICULTURAL LIMES REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE AGRICULTURAL LIME ACT 1934 (No. 4271) FOR THE YEAR 1948.

General Description.	Brand.	Calcium Oxide.	In the Form of—	Equivalent to Calcium Carbonate.	Magnesium Oxide.	In the Form of—	Degree of Fineness.	Price per Ton in 11-ton Lots.	Manufacturer.
							Material Passing Through a 20-mesh Sieve.		
		%		%	%		%	£ s. d.	
Ground Burnt Agricultural Lime	Lillydale, No. 1	87.70	Mainly oxide	156.90	5.00	Mainly oxide	65.00	3 9 9	David Mitchell Estate, Oliver's-lane, Melbourne, C.I.
" " "	" No. 2	80.00	"	143.00	5.00	"	60.00	2 19 6	David Mitchell Estate, Oliver's-lane, Melbourne, C.I.
" " "	Kawa Oxide	83.00	"	149.70	1.20	"	90.00	3 19 7	P. Alkemade and Sons, 535 Little Lonsdale-street, Melbourne
Agricultural Slaked Lime	Lillydale ..	60.00	Hydroxide and carbonate	107.23	3.00	Mainly hydrate	72.00	2 16 2	David Mitchell Estate, Oliver's-lane, Melbourne, C.I.
" " "	Cave Hill ..	50.00	"	89.50	5.00	"	72.00	1 13 10	David Mitchell Estate, Oliver's-lane, Melbourne, C.I.
" " "	White Rock	60.00	"	107.00	2.00	"	70.00	2 0 0	White Rock Lime Co. Pty. Ltd., 20 Queen-street, Melbourne
" " "	Bulldog ..	51.80	"	92.40	.80	"	60.00	2 5 0	Bulldog Lime Co. Pty. Ltd., 344 Swan-street, Richmond, E.I.
" " "	Kawa ..	66.00	"	119.00	1.20	"	92.00	3 0 1	P. Alkemade and Sons, 535 Little Lonsdale-street, Melbourne
Ground Limestone	Lillydale ..	50.00	Carbonate	89.50	3.00	Carbonate	95.00	1 7 6	David Mitchell Estate, Oliver's-lane, Melbourne, C.I.
" " "	Walker's ..	33.17	"	60.00	.79	"	65.00	1 10 0	David Walker, Waverley Lime Works, Lara
" " "	Lara ..	43.00	"	78.00	1.50	"	75.00	1 10 0	Lara Fertilizer and Lime Co., Lara Lake
" " "	Kurdeez ..	50.40	"	90.00	1.50	"	80.00	1 5 9	Victorian Agricultural Lime Ltd., 422 Collins-street, Melbourne
" " "	Kawa ..	51.00	"	91.00	1.20	"	75.00	2 2 1	P. Alkemade and Sons, 535 Little Lonsdale-street, Melbourne

Melbourne, 2nd December, 1947.

W. R. JEWELL, M.Sc.,
Chemist for Agriculture.



LIVE STOCK NOTES

Compiled by A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

WATER REQUIREMENTS

AN ideal supply of water for the farm livestock is one obtained from a running stream, spring, bore, town supply, or dam, laid on to all paddocks, pens, and yards through a pipe system to troughs for cattle, sheep, and horses, or automatic waterers for pigs and poultry.

The storage should be fenced off from the stock to prevent them churning up the mud and contaminating the water, and should be large enough to carry through the driest seasons.

The average daily water requirements of farm animals throughout the year are:—

Horses	.. 10 gallons per head
Dairy cattle	.. 15 gallons per head
Beef cattle	.. 10 gallons per head
Sheep	.. 1½ gallons per head
Pigs ..	.. 1½ gallons per head
Poultry	.. 6 gallons per 100 head

In proportion to their size, milking cows require a large amount of water. This is mainly because milk contains 87½ per cent. of moisture. Any shortage in the water supply is reflected by a drop in milk yields. A milking cow may drink from 5 to 40 gallons of water daily, the quantity depending upon her size, the amount of milk she is giving, the temperature and humidity of the atmosphere, and the amount of moisture in the food. Variations in the water requirements of other animals also occur.

At the University of Illinois, records of the water requirements of hens laying different numbers of eggs were recorded, and the following results were obtained:—

Average Annual Egg Production of Hens.		Average Quantity of Water Consumed per Year.	
Number.		lb.	
179		130	
216		155½	
230		171½	
243		178½	

Dry sheep and cattle may thrive for months in cool weather on succulent pasture grazed while wet with dew without drinking much additional water. But when there is a water shortage the feed is usually dry and there are practically no dews. When fed large quantities of skim milk, whey, or buttermilk, pigs may receive sufficient moisture in the feed. However, even under these special circumstances, it is advisable to have clean drinking water continuously available.

Stock usually drink several times during the day, and, for this reason, water should be available to them at all times. The water and the feed should always be situated close together, and, in times of drought, the stock should be given all supplementary feed close to water. This cuts down the expenditure of energy required to travel between feed and water.

Generally, stock should be allowed to drink as much water as they desire. With working horses, however, it is advisable that they be watered before being fed.

In summer milk yields frequently fall as the result of an inadequate or unattractive water supply. Clean, cool water should be accessible to the dairy herd in all paddocks and at the milking shed.

Water is used by farm animals for numerous functions. The body of the animal is more than half water. The blood and all other fluids and secretions in the body contain about 90 per cent. of water, while cows' milk contains about 87½ per cent. Water is necessary to soften and moisten the food for its passage through the alimentary canal. Digestion takes place only when moisture is present, and in it the digested food is dissolved and absorbed into the blood stream. Water is used to convey all the materials required by the body from one organ to another, and in it all the waste products are dissolved before being excreted.

Water is used also to regulate body temperature through the physiological function of perspiration or sweating. Food is eaten to develop heat, and water is evaporated from the lungs and pores of the skin to prevent the heat rising above a certain temperature, ranging between 98 degrees F. and 104 degrees F., according to the species.

The purity of the water supply is of importance since water may contain parasitic larvae, disease germs, organic matter, or excess minerals. Running water and water from springs, bores, and large fenced dams is usually free of parasitic larvae, disease germs, and excess organic matter, but may contain too much mineral. Water containing up to 400 parts of mineral salts per 100,000 parts is usually quite safe for drinking purposes, although for heavy milking cows, the water should not contain more than about 200 parts per 100,000.

In the control of parasitic diseases, it is essential that all dams and waterholes be fenced off from the stock, which should be watered from troughs. Where it is not possible to gravitate the water to the drinking troughs, a windmill or engine and pump are required. All troughs and automatic waterers should be regularly cleaned to maintain the purity of the drinking supply.

[A.C.T.H.]

A WARNING ON PIG QUALITY AND PRICE

The rather sharp drop in pig prices which occurred in Victoria towards the end of 1947 was noticed by all pig raisers, but did they heed the warning in the nature of the price drop?

For many months prior to that fall of prices there had been insufficient pigs to satisfy the demand for bacon and on such a sellers' market there was little difference between the prices of good pigs and those of poor quality, but as soon as it became a buyers' market, the buyers discriminated against over-fat and otherwise undesirable pigs.

By observing the discrimination at auction sales or by studying the gradings of pigs sold direct to bacon factories, pig raisers can see what the bacon trade wants and should then make any alterations in breeding or feeding practices necessary to avoid further direct financial loss.

Excessive fatness is the most common fault in bacon pigs. It can be avoided by marketing pigs as soon as they are fat enough for bacon irrespective of their weight or, if for some reason it is required to carry them on to heavier weights, their daily allowance of food should be restricted after they have become fat enough to kill,

to a little less than their appetites demand. By this method they can be grown on relatively slowly without becoming excessively fat.

The weight at which any pig attains the best condition for slaughter depends on its inherited type and on its feeding.

Although good bacon has a relatively small proportion of fat to lean, it should have well-developed lean (muscle). The development of muscles in a pig is influenced by breeding and feeding. The use of thick-hammed and strong-loined breeding stock and liberal feeding of pregnant sows and of their progeny so as to produce the fastest possible growth-rate up to the age of about four months, tend to encourage the development of bacon pigs with an abundance of lean meat. "Store" feeding of pigs under four months old should be avoided, and if any "store" feeding is practised it should be after the pigs are fat enough to yield prime bacon, that is, if it is desired to make them bigger but not fatter.

[L. A. DOWNEY, H.D.A., Pig Expert.]

CAPONISING COCKERELS

Caponising is not generally recommended since best prices are obtained for young cockerels at four to six months old, and since capons do not recover from the setback received from the surgical removal of the testes quickly enough to be ready for market at such an early age. To overcome the setback of the surgical operation, much prominence is being given to the suppression of masculine characteristics by the feeding of oestrogens.

One of the oestrogenic substances used for this purpose is dianisylhexene. It is also referred to as the dimethyl ether of di-ethyl stilboestrol and has been used in America as an effective oestrogen when dissolved in soybean oil and fed at the rate of 30 to 50 milligrammes per lb. of mash for a period of three to four weeks. As the caponising effect of these oestrogens is not maintained after withdrawal, the feeding is commenced three to four weeks before the birds are to be dressed.

Generally the use of these materials is not recommended for, although the implant method is quite successful, there is a tendency for the hormone to be retained

in the body fat of the treated poultry, and the probable effect on the human consumer ingesting this material is unknown.

There is a technique of implanting 15 milligrammes of di-ethyl stilboestrol high in the neck which has proved satisfactory as that portion of the neck is usually discarded.

The use of oestrogens is not recommended at the present time on account of the expense of the oestrogens and the lack of precise knowledge of their efficiency and of the possible effect of the residues remaining in the dressed carcasses on persons eating them.

[A.C.T.H.]

CULLING NON-PRODUCTIVE POULTRY

Regular culling pays dividends, and, while realising its importance, a large percentage of poultry farmers are unable to carry it out owing to pressure of other duties. However, as the moulting season approaches, it will be seen that a percentage of the flock commences to moult earlier than others, and it is these early moulters that should be segregated and sent off to market.

The statement, "first in the moult last into lay," is fairly reliable and poultry farmers usually take prompt action by disposing of these birds as soon as they can be recognised.

Birds that moult during February should be classed as culls and dealt with accordingly, but those that lay into March should be maintained until the annual culling takes place—about April, and, as with the balance of the flock, judged on their physical condition and general body characteristics.

Hand culling undoubtedly has its limitations, and the only reliable method of obtaining information as to the suitability of a bird for breeding purposes is by single testing or trap-nesting. Experienced men can readily recognise the very good, and the coarse non-productive bird, but it is not possible to assess the value of the medium-quality bird by hand culling. The usual method of culling flocks is to grade them into breeders, layers, and culls. The culls are immediately disposed of and the breeders held for another season, while the layers are disposed of as soon as they cease production.

The selection of high producers by sound rigid culling often results in breeding a number of birds that do not moult at all and this is nature's method of resting the bird.

They are sometimes forced into a moult, but certain individuals refuse to moult even when submitted to very harsh treatment.

The high cost of foodstuffs and the difficulty in obtaining supplies should be an incentive to all poultry farmers to watch out for and dispose of all early moulters, rigidly cull the flock and promptly despatch all unwanted birds to market.

[M. D. HALL, Poultry Expert.]

BEEKEEPING

Late summer and autumn-blooming eucalypts, usually yield a prolific supply of pollen and create ideal conditions for queen rearing. Colonies from autumn-raised queens bred from selected Italian stock, if given sufficient room for brood expansion in the following spring, are less likely to swarm than colonies from older queens, and from queens raised naturally without selection by the beekeeper. Frequently beekeepers will draw attention to a colony that has been outstanding in the season's production of honey, or to another that has passed through the second year without attempting to swarm; but very few will enthuse over the possibility of improving the strain within the apiary by giving time and thought to selective breeding from both. The practice generally followed is to purchase a few fresh queens each year and hope for the best. Carniolan, Italian, and hybrid bees are often seen together in some of the largest apiaries.

Unlike some of the States, Victoria is at a disadvantage in not having legislation to protect the stock and bee-pasturage of the individual beekeeper from exploitation

and contamination by those without respect for the rights and properties of others. While not wholly responsible for lack of enthusiasm, this is hardly conducive to a sound and continuous selective breeding policy since security against trespass by undesirable drones is the main factor in successful selective breeding of bees.

[J. W. THOMLINSON, Apiary Inspector.]

YOUNG FARMER ANNUAL

The Young Farmer Annual 1947, edited by H. C. F. Morant ("The Young Farmer," 7 Crimea Street, St. Kilda, 72 pages, six colour plates, 3s. 8½d. posted.)

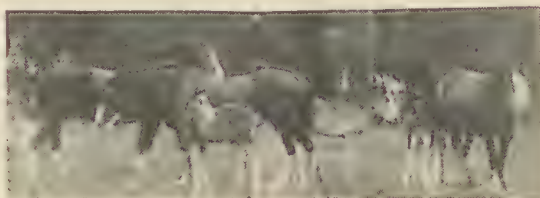
The Young Farmer Annual is a splendid book well printed on art paper with six beautifully-coloured full-page plates and over 50 excellent illustrations.

There are 25 well written articles of agricultural and general interest by prominent authors, in addition to a number of informative short notes. Some of the subjects covered are Agricultural Education, Big Game Hunting, Birds, Blowflies, Contour Farming, Dairy Cattle Breeding, Hydatid Disease, Merino Sheep, Museums, Poultry-farming, Rabbit Skins, The Veterinary Profession, Trees, Vegetables, Vitamins, and Wool. The authors include a number of well-known officers of the Department of Agriculture, Directors of the Zoological Gardens, Botanical Gardens, and National Museum, and businessmen.

Robins, cuckoos, mudlarks, plovers, magpies, herons, flycatchers, owls, and wood swallows are dealt with in turn by Mr. Crosbie Morrison, M.Sc., editor of "Wild Life". His article, "Bird Friends of the Farmer," is illustrated with excellent colour plates.

Well illustrated notes on how to make a simple, small, concrete pig-feeding trough and concrete steps are also included.

[Reviewed by A.C.T.H.]



TREATMENT OF WOUNDS IN FARM ANIMALS

By B. H. RUSHFORD, B.V.Sc., Veterinary Officer

The man on the land is frequently called upon to act as his own veterinarian, particularly in cases where wounds are incurred by the animals under his care. Unfortunately the treatment of wounds in animals is often carried out haphazardly, due to ignorance of the processes underlying the repair of wounds.

It cannot be emphasized too strongly that wounds are healed by a natural method of repair, and our efforts can only be in aiding nature in her work. What assistance we can render depends to a large extent on the type of wound, and it is proposed in this article to discuss the treatment of the various types of wounds.

IF it were possible to exclude germs from wounds, healing would take place by the natural processes of repair. Such ideal conditions unfortunately are impossible to attain in the case of animals, and so we must devote our attention to combating the infection in the wound. This most certainly cannot be done simply by applying some particular disinfectant, but necessitates rather the use of scrupulously clean dressings and instruments, the provision of clean, airy quarters, and a means whereby drainage of the wounds can be maintained. Of course, as the wounds of animals are almost invariably infected, an antiseptic or disinfectant dressing is necessary, but it is no more than an aid. No irritant disinfectants should be used, as they will destroy the cells of the tissues, and hinder rather than help the processes of repair.

The following points should be borne in mind when dealing with wounds in general :—

TREATMENT

1. Provide clean well-ventilated quarters. Horses, under treatment, do much better at pasture than in stables, if the weather is suitable.

2. Be as gentle as possible when dressing the wounds. Rough handling of injured tissues may lead to greater injury and a consequent retarding of repair.

3. Clip closely or shave the hair around the wound. If this is not done, the discharges will cause matting of hair making an ideal site for fresh infection.

4. In dressing a wound, make sure that no discharge from around the edges is carried into the wound.

5. Ensure strict cleanliness of all dressings and utensils used. This can be done by placing them in cold water and bringing to the boil. The addition of a tablespoonful of washing soda will prevent the rusting of steel instruments. Cotton-wool and gauze can be boiled quite satisfactorily. Destroy all soiled dressings by burning.

6. Never use irritant disinfectants on a wound.

7. Ensure the provision of suitable drainage from the wound.

TYPES OF WOUNDS

Turning now to particular types of wounds, we find two chief classes :—

- (a) Closed wounds or contusions, and
- (b) open wounds.

In contusions, the skin is not broken, but is bruised as also are the deeper structures. A familiar example is the soft swelling resulting from a kick near the buttock of the animal. The treatment in such cases is simple, and consists of rest and the frequent application of warm fomentations. Only in rare cases is it necessary to incise the skin, that is, when a large artery has ruptured and ligation is necessary. Such cases need the attention of a veterinary surgeon.

Open wounds may be of various types, and those of most interest to stock owners are incised, lacerated, and punctured wounds. An incised wound is one caused by a sharp instrument or any article having a sharp edge. It will vary in extent and depth according to the form or shape of the object causing it, the amount of force employed, and the nature of the tissues. Arteries may be divided, causing severe haemorrhage, and in such cases the bleeding must be stopped. This can be done in several ways. Strong pressure by holding swabs of cotton wool against the wound is often sufficient to stop the flow of blood from small vessels. Larger vessels may be secured by applying artery forceps to them, and by passing around them a sterile loop of suture material, so ligating the vessels. In some cases, it is impossible to isolate and identify the bleeding vessel from its surrounding tissues, and then a mass of tissue should be tied sufficient to include the vessel. This is done by passing through the tissue a curved needle threaded with suture material. After the bleeding has been stopped, the next step is to clip or shave the hair closely around the edges of the wound, and paint the area with tincture of iodine. Then, after first searching for and removing with sterile forceps any foreign body present, the interior of the wound must be cleaned.



This type of wound should not be sutured.

The best method of cleaning the wound is to irrigate it with a syringe and antiseptic solution, of which there are many available.

Such solutions as carbolic acid (1 part to 40 of water), 1 per cent. lysol, and various proprietary preparations are all useful antiseptics. An owner must realize that the ultimate result of his treatment will depend to a large degree on how thoroughly this initial irrigation is carried out.

The next step is usually the suturing of the wound. It is necessary to ensure always before suturing that the interior of the wound is thoroughly cleansed, and secondly that provision is made to allow the wound to drain after the suturing has been done. Again an owner must remember that suturing is not always advisable. This is certainly the case when a wound is so large and in such a position that efficient cleansing is impossible, and also in those cases where it is almost certain that the sutures would be pulled out by the subsequent movements of the animal, for example, a wound in a horse at the region of the stifle and including skin both on the hind leg and on the abdomen. In this case, the pull of the muscles of the hind leg as the horse walks would make retention of the sutures difficult. Suturing such a wound would do more harm than good.

Suturing materials are of various kinds. The two types most useful to the layman are silk and cotton, which must be sterilized before use, by boiling, and then placed in an antiseptic solution from which they can be drawn as required. The suture known as the interrupted suture is the only one which will be described here, because other types necessitate the services of a veterinary surgeon. To make ordinary interrupted sutures, a number of stitches are made, each separately fastened and distinct in itself, and placed at intervals along the direction of the wound. Thread the needle with the material to be used, and pass through the divided tissues and tie a reef knot so that it lies well to one side of the incision line. Do not insert the needle too close to the edge of the wound, and do not put in too many stitches or the wound may not drain properly. For example, in a wound six inches long, three stitches would be ample. Again it must be emphasized that cleanliness and irrigation

of the wound is more important in the treatment of wounds in animals than the provision of sutures.

In the after-treatment of an incised wound that has been sutured, nothing further is necessary if efficient drainage is provided, though the use of sulphanilamide as a dusting powder would be advantageous. If, however, suppuration occurs and the edges of the wound become inflamed, remove some of the sutures and wash out the wound daily with an antiseptic solution.

A lacerated wound may be described as one produced by a fairly blunt object; consequently the tissues including the skin are torn. The treatment of such wounds follows much the same principles given above for incised wounds. In addition, there is usually a certain amount of dead and dying tissues, such as tags of skin and muscle, which must be removed. Stop any haemorrhage and clean and disinfect immediately and efficiently. As these wounds are frequently extensive, efficient drainage is often difficult to carry out, but time taken in ensuring that dependent drainage is provided and that there are no pockets of pus present will be well spent. As these wounds are often irregular and large, suturing is neither required nor advisable. The insertion of stitches in lacerated

wounds in the same way as is done for incised wounds is usually followed by suppuration and the sloughing out of the stitches.

Punctured wounds are characterized by an insignificant surface opening, and considerable depth. Examples are punctures of the foot due to gathered nails, and of the limbs and body due to sharp thorns and sticks. Quite often a foreign body is present in these wounds without being suspected. The chief essential in such punctures is the provision of efficient drainage and, where possible, the services of a veterinary surgeon, as such wounds are much more difficult to deal with than the incised or lacerated type.

As a precaution against losses due to wounds in his animals every stockowner should have on hand the following materials so that he may provide efficient first aid service as required:—

Cotton wool; two pairs of artery forceps; a scalpel; a pair of curved scissors; a supply of suture needles (curved ones are most suitable for the layman); suture material; a supply of a reliable antiseptic; some sulphanilamide powder; a syringe to irrigate wounds; a supply of bandages, and a clinical thermometer.

SCALY-LEG MITE ON POULTRY

The two legs are usually attacked at the same time, and show the condition to the same degree. There is only a slight roughening of the surface of the legs at first, but continued irritation by the mites causes the formation of a spongy or powdery substance under the scales, which become raised and easily detachable. Scaly-leg is readily transmitted from bird to bird. Common hosts are domestic fowls, turkeys, pheasants, pigeons, and cage birds.

The most effective treatment is to dip the feet and shanks of the affected bird in crude oil, and scrub thoroughly with a hard brush. Care should be taken not to get the oil on to the upper parts of the legs or on the feathers. Dipping is best carried out in the morning to allow the oil to drain off before the birds go to roost. Another effective treatment is to wash the legs in soapy water, removing loose scales with a brush, and apply a mixture of lard 9 parts and sulphur 1 part. Disinfection of the perches by spraying with crude oil is also recommended.

[Contributed by the Biological Branch.]

Seed Certification in Victoria

List of Growers and Registered Areas Approved for 1947-48 Season

Seed certification schemes are in operation in Victoria in respect to the following species and strains of pasture seeds.

1. Victorian Perennial Rye Grass.
2. Victorian Phalaris Tuberosa.
3. "Bacchus Marsh" Early Flowering Subterranean Clover.
4. (Tallarook) Late Flowering Subterranean Clover.
5. Victorian Irrigation White Clover.
6. "Mount Barker" Mid-season Flowering Subterranean Clover (numbers not yet allocated; will appear in a subsequent issue).

Growers with areas approved for 1947-48 are as follow:—

I. VICTORIAN PERENNIAL RYEGRASS

- R.G.—
1. Pickford, A., Clunes.
 2. McKinley, H., Clunes.
 3. Toose, F. W., Lawrence.
 5. Bridgewater, E. S., Learmonth.
 6. Toose, H. A., Smeaton.
 9. Troup, G., Tourello.
 10. Sewell, C. W. and Son, Kooroocheang.
 11. Fenton, C. H., Coghill's Creek.
 16. Robinson, H., Clunes.
 19. Pickford, C. A., Clunes.
 20. Pickford, J., Clunes.
 22. Williams, A., Smeaton.
 24. Evans, J., Smeaton.
 27. McCrum, J., Smeaton.
 28. McKinnon, A., Smeaton.
 29. Grieve, W. M., Kangaroo Hills.
 31. Sewell, A. J. and D. H., Smeaton.
 33. Toose, A. W. and G. C., Smeaton.
 35. May, W. H., Smeaton.
 39. Ward, J., Kingston.
 41. Muller, C. T., Ullina.
 43. Carter, J., Estate of J. R., Clunes.
 44. Drife, G. R. H., Clunes.
 46. Cosgrove Bros., Smeaton.
 47. Bunn, J., Allendale.
 50. Cook, W., Clunes.

51. Drife, C. J. H., Clunes.
52. Drife, T. W., Clunes.
54. Hives, J. H., Kingston.
55. Muller, J. H., Smeaton.
57. Kinnersley, F., Glendaruel.
59. Armstrong, J., Allendale.
62. Spittle, S. G., Estate of, Ascot.
69. McLennon, A. C., Clunes.
72. Ford, H., Clunes.
74. Redman Bros., Smeaton.
88. Wrathall, D. W., Clunes.
93. Luhrs, C. R., Wendouree.
98. White, W. W., Alfredton.
99. White, R. T., Cardigan.
102. Higgins, F. W., Irrewarra.
104. Carrington, A. H., Warncoort.
106. Osbourne, A. G., Warncoort.
107. England, S. C., Warncoort.
108. England, Mrs. G., Warncoort.
109. Hay, J., Private Bag, Colac.
110. Grey, Mrs. G., Colac West.
112. Hawtin, F., Colac.
116. Kenny, M., Cororooke.
118. Martin, H. L., Irrewarra.
119. Menzel, C., Armytage.
120. Menzel, R. K., Armytage.
123. McMillan, T. S., Cororooke.
125. Roache, J., Nalangil.
126. Roache, P., 23 Ligar-street, Colac.
129. Turner, J. R., Neale's Bag, Colac.
132. Milne, H. R., Colac West.
133. Rankin, A., Colac.
137. Small, A., Ondit.
138. McCready, D., Ondit.
140. Dignan, A., Warncoort.
141. Hughes, A. E., Neale's Bag, Colac.
142. McDonald, J. J. and Sons, Birregurra.
147. Mackay, D. G., Irrewarra.
148. Middleton, A. H., Nalangil.
150. Speirs, A. E. and Sons, Nalangil.
154. Smith, Stan, Colac West.
155. Vagg, E. L., Neale's Bag, Colac.
158. Spalding, J. A., Neale's Bag, Colac.
160. Billing, F. H., Colac.
166. Inglis, A. D. C., Private Bag, Colac.
167. Speirs, F. C., Private Bag, Colac.
169. Collins, G. J., Irrewarra.
172. Conheady, J., Nalangil.
173. Brien, A. J. and Sons, Birregurra.
181. Gubbins, N., Birregurra.
187. Hayes, G., Colac.
198. Rowan, J. G., Cororooke.
200. Elbourne, A. J., Irrewarra.

R.G.—201. Bolton, M., Malmesbury.
 202. Ward, A. and N., Kyneton (Box 31).
 203. Sullivan, Thos., Malmesbury.
 206. Hutcheson, S. G., Kyneton.
 208. Keegan Bros., Lauriston.
 210. Donovan, J., Malmesbury.
 213. Thompson, G. H., Kyneton.
 217. Young, H. H., Kyneton.
 225. Trehwella, A. B., Newham.
 226. Deltman, Miss E., Kyneton.
 227. Rollinson Bros., Green Hill via Kyneton.
 233. Lyall, T., Redesdale Junction.
 234. Henderson, L., Lauriston.
 236. Coiles, J. F., Kyneton.
 244. Rowe, L., Kyneton.
 249. Chase, A. H., Kyneton.
 250. Halloran, J. J., Kyneton.
 251. Buchholz, L. G., Lismore.
 258. Moloney, P. G., Terang.
 265. McConnell, C. L., Kolora.
 284. Calvert, N., Nerrin Nerrin.
 297. Fitzgibbon, P., Mortlake.
 306. Walton, W., Burrumbeet.
 307. Robinson, E. J., Kooroocheang.
 313. Luhrs, C. and B., Wendouree.
 320. Mezzini, W., Kooroocheang.
 323. Irving, D. L., Miners' Rest.
 331. MacRae, C., Tourello.
 332. Nicholls, P., Kooroocheang.
 333. Charleson, Mrs. Madge, Kooroocheang.
 339. Lange, F. J., Learmonth.
 342. Donovan, J., Learmonth.
 343. Davey, J. M., Miners' Rest.
 344. Wilson, A., Ascot.
 345. Taylor, W., Kingston.
 346. Charleson, E., Allendale.
 348. Seamens, W., Kooroocheang.
 350. Matthews, A. M., Burrumbeet.
 358. Redemptorist Fathers' Monastery, Wendouree.
 359. Morganti, A. H. and M., Eastern Hill, Eganstown.
 360. Haintz Bros., Rockie Lead.
 361. White, T. L., Alfredton.
 406. Roache, D., Nalangil.
 407. Menzel, A. A., Winchelsea.
 418. Williams, O., Colac.
 423. Craig, N. and I., Winchelsea.
 428. Baker, E. C., Birregurra.
 435. Arstall, W., Roadside, Colac.
 436. Stewart Bros., Birregurra.
 437. Bourke, J. M., Cororooke.
 438. Johnson, S. A., Birregurra.
 443. Forrest, E. L., Estate of, Irrewarra.
 444. Burns, Alan, Conunnun.
 445. Lidgerwood, R. W., Birregurra.
 447. Lynch, D., Cororooke.
 450. Champness, P. L., Mount Moriac.
 459. McKenzie, D. G., Private Bag, Colac.
 460. McRae, A., Colac.
 465. Wilson, R., Private Bag, Colac.
 479. Stinchcombe, E., Box 52, Colac.
 485. Farquharson, W., Pennyroyal.
 486. Ryan, F. P., Private Bag, Colac.
 487. Higgins, J. T., Irrewarra.
 491. Stanford, F. R. J., Tomahawk Creek via Colac.
 492. Mackay, D. J., Warncoort.
 493. Turner, M., Nalangil.
 494. Finn, T. J., Bullock Swamp.
 497. Arnold, F. E., Carlisle River.
 505. Finn, P., Bullock Swamp.
 507. Roberts, R. G., Irrewarra.

508. Johnson, F. E., Ricketts Marsh.
 511. Jeannes, E., Irrewarra.
 512. Shelton, G. C., Irrewarra.
 514. Prime, H. and Sons, Muroon.
 515. Dennis Bros. Warncoort.
 517. Goonan, P. J. and Sons, Cororooke.
 520. Gannon Bros., Muroon.
 526. McDonald, D., Dean Marsh.
 528. Ryan, W. G., Private Bag, Colac.
 541. Crabbe, C. F., Larpent.
 533. O'Shannessy, V., Cororooke.
 539. Turner, J. R., Larpent.
 544. Williams, P. L., Box 34, Camperdown.
 549. Moran, J., Ondit.
 550. Mathews, A. R. and R. H., Nalangil.
 551. Leigh, J., Winchelsea.
 552. Inglis, G., Warrion.
 553. Nicholas, G. D., Ricketts Marsh via Birregurra.
 554. Johnson, F. H., Ricketts Marsh via Birregurra.
 555. Southdown Pastoral Co. Ltd., Skipton.
 557. Tanis, J. F., Irrewarra.
 558. Fleay, W. H., Winchelsea.
 559. Drake, L. H., Balinton via Colac.
 560. Cornish, L. A., Tarranlea via Coleraine.
 562. Hurst, E. W., 49 Chapel-street, Colac East.
 563. McRae, I. E., Pekin's Bag, Colac.
 564. Darcy Bros., Coagulac.
 565. Lewis, A., Colac West.

2. PHALARIS TUBEROSA

P.T.—3. Beggs, S. R., Willaura.
 9. Buchholz, L. G., Lismore.
 10. Calvert, M., Nerrin Nerrin.
 17. Champness, P. L., Mount Moriac.
 24. Gubbins, A. W., Chatsworth.
 25. Schurmann, Theo., Mountajup via Hamilton.
 26. Simpson, J. R., Moyhu.
 27. Edgar, O. W., Harrow.
 29. James, A. T., Warrenbayne.
 30. James, H. W., Warrenbayne.
 32. McQueen, J., Girgarre.
 34. Dennis Bros., Warncoort.
 35. Manks, W., Clyde North.
 37. Wilson, A., Beaconsfield.
 38. Love, W. H. and W. T., Narre Warren.
 39. Ryan, Col. R. S., Berwick.
 41. Lloyd, J. C., Narre Warren.
 42. Council for Scientific and Industrial Research, Parkville.
 45. Dennis, J. V., Warncoort.
 46. Carter, Estate of J. R., Clunes.
 47. Toose, G. C. and A. W., Smeaton.
 48. Millar, S. F., Willaura.
 49. Fletcher, C. I., Buffalo River via Myrtleford.
 50. Gibb, J. T., Moyhu.
 51. O'Rourke, J. W., Thornton.
 52. Learmonth, L. W., Coleraine.
 53. Neagle, A. E., Private Bag, via Narracoorte, S.A.
 54. Southdown Pastoral Co., Skipton.
 55. Calvert, W. and J., Private Bag, Myrtleford.
 56. May, J. L., Tooradin North.
 57. Warman, Box 10, Cranbourne.
 58. Widemann, G. N. and Sons, Laceby Roadside via Wangaratta.
 59. Wilson, A., Beaconsfield, Farm No. 2, Tooradin.
 60. Thomas, R., Apsley.

3. BACCHUS MARSH SUBTERRANEAN CLOVER

Early Flowering Strain

- B.M.—1. Toose, G. C. and A. W., Smeaton.
4. Koch, L. T., Wando Vale via Coleraine.
6. Kennedy, M., Arcadia.
7. McQueen, R. C., Girgarre.

TALLAROOK SUBTERRANEAN CLOVER

Late Flowering Strain

- T.K.—1. Head, E. C. L., "Mundarra," Seymour.

IRRIGATION WHITE CLOVER

- I.W.— 2. Hamley, H. J., Dingee.
3. Jackman, J. W., Dingee.
7. McEwan, J., Stanhope.
13. Bullingham, J., Tongala.
18. Badenhop, H. C., Katandra.
24. Coleman, F. S., Katandra.
26. Collier, W. B., Tongala.
27. Lindsay, R. N., Tatura.
28. Hamley, C. E. and R. F., Dingee.
29. Hamley, E. R. and H. J., Dingee.
30. McPhail, R. M., Tatura.
31. Kerr, R., Toolamba.
32. Grey, H., c/o N. McCauley, P.B., Kerang.
33. Spence, J. A. and Co., Dingee.
34. Coombes, T., Tongala.

BLOAT IN CATTLE

Symptoms of the trouble appear very suddenly, and animals on pasture often continue to graze until signs of discomfort, or actual pain, are evident. The abdomen, particularly on the left side, becomes distended, and pain is evidenced by the animal frequently looking at its sides and paddling with the hind feet. The head is extended, nostrils are dilated, while the mouth may be open. Respiration is irregular.

Removal of the gases from the rumen is the primary object of treatment, and, if bloating has just started, the animal should be forcibly exercised, and the distended abdomen massaged or kneaded with the clenched fist to bring about belching of the gases from the stomach. This process may be assisted by placing a wooden gag in, and across, the mouth.

In advanced cases, the easiest and most effective way of withdrawing the gas is to puncture the rumen by means of the trocar and cannula. After clipping the hair over the left flank, a disinfectant, such as tincture of iodine, should be applied to the skin,

and an incision made with a knife at the highest point of the distended flank. The trocar and cannula are then inserted in a downward and forward direction with sufficient force to penetrate in one operation the abdominal wall and the wall of the paunch. The cannula or tube is then held in position while the trocar is withdrawn, permitting the escape of gases.

Mild cases of bloat may be treated by medicine administered for the purpose of removing gas. Any of the following mixtures may be used:—Sodium hyposulphite, at the rate of 2 to 5 oz. in 1 pint of water, or 2 drams of formalin in 1 pint of water, or a mixture of 2 oz. pure turpentine with 15 to 20 drops of oil of peppermint in 1 pint of raw linseed oil.

Further information on the treatment of bloat may be obtained in the pamphlet, "Hoven or Bloat," which may be obtained free on application to the Director, Department of Agriculture, Melbourne, C.2.

[Contributed by the Live Stock Division.]

MODERN TECHNIQUE IN THE CONTROL OF PRE-HARVEST DROP

*To Control pre-harvest
drop of apples and pears*

SHELLESTONE

Plant Hormone Spray

This hormone spray controls pre-harvest drop. It must be applied to the fruit stalk by using a driving spray under high pressure. It becomes effective 2-3 days after application, then remains effective for 2-3 weeks. Consequently, the spray should be applied about 12 days before picking. If harvesting lasts longer than a week, a second application should be given.

Shellestone does not delay ripening. Fruit should not be allowed to hang beyond normal maturity.

Method of using SHELLESTONE

In addition to the main hormone constituent, alpha naphthalene acetic acid, Shellestone contains wetting and spreading agents to assist in thorough coverage and maximum effect.

Pour directly into the spray vat with agitators in operation. It mixes immediately with hard or soft water. It also combines readily with Shell Whitespray.

*Supplies of Shellestone may be obtained from your nearest Shell
Depot or Agent and from Fruitgrowers' Organisations etc.*



SHELL

SPRAYING RECOMMENDATION

SHELL SPRAYING OILS FOR ALL FRUITS AND ALL SEASONS

THE SHELL COMPANY OF AUSTRALIA LIMITED (Incorporated in Great Britain)

5047 13P

AN APPLE ON THE TREE IS WORTH
A BUSHEL ON THE GROUND

“CLING-SPRAY”

(Naphthalene Acetic Acid)

STOPS PREHARVEST DROP

Simply mix the contents of one 4 oz. bottle of
“Cling-Spray” in 100 gallons of water, and
spray in the normal manner when the first few
of the maturing fruits are observed to fall.

Packed 24 by 4 oz. bottles per carton.

Price—11/6 per bottle plus freight.

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VICTOR LEGGO & FARMERS LTD.

Box 508 H G.P.O., MELBOURNE

Supplies Obtainable All Agents

New South Wales Distributors:

BUZACOTT, WOLSELEY PTY. LTD.,

7-11 MARKET STREET, SYDNEY

ORCHARD NOTES

— By —

A. G. GOUDIE, B.Agr.Sc., Horticultural Research Officer

The following notes were the subject of a lecture given at a Citrus Field Day held at Redcliffs last spring

SYSTEMS OF IRRIGATION FOR CITRUS IN THE MILDURA AREA

EFFICIENT irrigation consists of bringing the root zone of the crop back to field capacity as often as the crop approaches wilting point. No water should pass beyond the root zone because, not only is such water wasted, but it gradually accumulates and may eventually become dangerous by causing a rise of salt to the root zone or a straight out waterlogging effect. In any case, the waste of water to the sub-soil is at least as deplorable as water obviously run to waste on the surface. Irrigation efficiency in Mildura districts is commonly as low as 50 per cent. This figure tends to be worst on the light citrus soils of the district because these are most permeable. Many growers have realized this, and an increasing number of enquiries are being made about spray irrigation, which gives relatively even and controllable penetration of water into the soil. There are several types of spray irrigation, and these have been divided into three classes according to the amount of labour involved in operating the equipment.

(I) Permanent Installation

Two types of permanent installation are being experimented with in Victoria, and are approaching the commercial stage. One gives an intermittent heavy discharge of water, controlled automatically, from each



Irrigation water being discharged from a permanent rotating nozzle.

in turn of a series of permanent rotating spray heads spaced at the rate of one per acre, and the other gives a continuous light discharge of water from permanent rotating spray heads spaced at the rate of six per acre. At the present stage of development, the former does not give a satisfactory distribution of water under medium or high-wind conditions and operates under a head of up to 250 feet. The latter does not give really satisfactory distribution of water under any wind condition, but there seems to be no reason why this should not be corrected, at least under light-wind conditions. Its operating head is about 70 feet.

Permanent sprinklers have the big advantage that no significant amount of labour is required to do the actual irrigating;

also, there is no trouble with night watering under a strict roster. Some method of frost prevention might possibly be developed using either of these systems.

(2) Portable Installation Requiring Frequent Shifting of Sprinklers

Several systems are available in which each sprinkler is on a light-gauge galvanized-iron pipe usually about 18 feet long and 3 or 4 inches in diameter. These are joined to form a spray-line long enough to suit the shape of the block and the capacity of the pump. Two spray-lines are normally used so that one is operating while the other is dismantled and carried to the next row.

The design of the sprinklers varies slightly according to the system, but all give a reasonably even distribution of water by overlapping. The best working pressure is about 40 feet, although there is normally sufficient throw at 25 feet head; if the pressure is much greater than 60 feet, the spray becomes so fine that it does not throw far enough and wind causes an increasing effect on the distribution pattern.

Most systems in use throughout Victoria fall into this class, and growers base their particular preference on such small points as the method of linking the pipes together and to the underground main, or having the pipes on stands at a convenient height to limit the amount of stooping. These are quite important features since each action is repeated about 100 times per acre per irrigation on the average citrus orchard.

The main drawback of all these systems is that one spray-line has to be shifted every hour or thereabouts. This is almost impracticable at night, and, under a rigid roster, it means that the irrigator must have much of his block under furrow system. Also, equipment has to be carried over freshly-irrigated land, which makes the work arduous.

(3) Equipment Requiring Occasional Shifting

One of the latest appearances on the market consists of a few portable rotating heads with a high-discharge rate. These are capable of watering up to 2.4 acres per head per shift. Their distribution pattern is affected by wind, and they require pressures of up to 230-ft. head at the jet.

Each jet delivers $\frac{1}{4}$ to $\frac{1}{2}$ inch of water per hour depending on the model and operating pressure used. Therefore, the spray-heads require shifting only every 8 to 12 hours, and the system is adaptable to over-night watering. The necessity of shifting the spray-heads might be considered a disadvantage; yet the mobility implied by this apparent disadvantage might be developed to overcome the objection of wind effect.

The Kook system, which also falls into the "occasional shift" class, has been in use for over twenty years, but has not been pushed commercially, since it is so simple that no vital patents can be taken out on it. Growers using, or familiar with the use of this system, are not tending to change over to newer, more complex systems. The laterals consist of up to 220-ft. lengths of $1\frac{1}{2}$ -in., 26-gauge downpipe simply pierced with an awl of elliptical cross-section with major axis .00465 inch and minor axis .0093 inch, to make an orifice every 3 feet. Each irrigation "set" usually waters a quarter or an eighth of the whole area. The orifices deliver approximately $\frac{1}{2}$ inch of water per hour, which means that a "set" will last for about 8 hours. The laterals have to be twisted every two hours or so to alter the direction of throw of the orifices. A commercial oscillator is now on the market and would probably be adaptable to this system.

Changeover of the "set" consists of disconnecting the laterals, and dragging them through to the other side of the supply main with a horse, and reconnecting. It is therefore unnecessary to walk on freshly-irrigated ground. One drawback of the system is to find a place to stow the laterals during cultural operations.

EFFECT OF WIND ON DISTRIBUTION OF WATER

The effect of wind is important in all except the Kook system. Portable spray-line types require at least a slight breeze for their most effective operation, otherwise water from each individual jet in the sprinkler tends to be concentrated on a small strip of soil. Relatively strong wind does not cause an undesirable distribution pattern, provided the correct operating head is used, because each head only waters a relatively small area and overlap is considerable.

Rotating heads watering a large area per head must each have a critical wind velocity above which they are ineffective. No specific data concerning this factor is yet available. A common impression is that spray is blown down-wind, and, therefore, the wind effect does not alter the general spray distribution except with the spray-heads near the windward boundary of the block. However, it is often forgotten that the spray-head will not throw its full distance at right angles to the wind. In other words, a layout with minimum overlap will, in windy weather, leave strips of dry soil in the direction of the wind.

ADVANTAGES AND DISADVANTAGES OF SPRAY IRRIGATION

In general, capital costs will vary from £30 to £85 per acre, depending mostly on the size and shape of block, type of installation desired, duration of irrigation, and position of the water supply. Costs would be considerably reduced if aluminium piping becomes available under as promising conditions as in U.S.A., where high-pressure piping in popular sizes is claimed to be approximately one third the price and one tenth the weight of the iron counterpart.

Running costs per year of a spray system will be roughly £2 to £7 per acre, according to whether the system requires 40 to 200-ft. head at the spray jet, plus actual cost of water, and depreciation. This calculation is based on power at 3d. per unit (Kilowatt-hour), water requirement at 2 acre-feet per season, and average pump and pipe-line efficiency.

Spray systems are specially suited to light, undulating soil because the desired amount of water can be applied accurately; also, irregularity of contour causes no extra operating or installation costs.

Grading of the land is unnecessary. Soil fertility is reduced where surface

soil is removed by grading, and although the fertility is increased where the surface soil is dumped, this does not compensate for the loss it has caused elsewhere; and grading is expensive.

There is no need to design irregular-shaped blocks because of irregular contours.

No head ditches are necessary. This means less waste land and easier tillage operations.

No furrowing or smoothing is necessary.

Spray irrigation is not normally suitable for heavy land, because the rate of absorption is too slow for the delivery rates of most systems. Also, surface irrigation is cheap and efficient because of the long runs possible, and over-watering is easy to avoid under the furrow system.

Soil structure is slowly destroyed when water droplets fall on bare soil, the rate of destruction increasing with droplet size. Spray irrigation could, because of this effect, rapidly induce impermeability in some of the heavier, cultivated soils of northern Victoria. The largest droplets tend to be produced in spray-heads throwing long distances.



Portable spray irrigation equipment in a citrus grove.

Spray-lines should, as far as possible, be run along the contours because run-off and erosion is likely to occur even on light soils if the spray-lines are run up and down the slopes.

FLAT-GRADE FURROW IRRIGATION

On land which has slopes of less than 2 feet per chain, and not too many minor hills and hollows on the main slope, consideration should be given to flat-grade or contour irrigation. This consists of planting so that the irrigation furrows have a fall of about 2 inches per chain on a soil like Murray sand. By using a flow of the order of 30 gallons per minute in each furrow, water will reach the end of a 5 to 7-chain run in about 30 or 40 minutes, and is then shut off. The furrow gradient is so flat that erosion will not occur even with the comparatively enormous flow in it. Experiments on Murray sand have shown that water applied for times varying from 25 to 40 minutes wet the soil to a depth of 2 feet 6 inches. The figures given for slopes and flow rates are only illustrative, and are selected; having regard to the general character of the soil type and to data available, so as to give a practical idea of the method.

The method requires no expensive plant and equipment, and, if properly carried out, can be as efficient as spray irrigation so far as water distribution is concerned. However, the land has to be very accurately graded, furrows have to be large and well formed, and continuous patrolling is necessary. Cross grades of more than

2 feet per chain in citrus make it fairly easy for water to break out of the furrows unless the block is terraced.

Night irrigation is possible if high-powered lanterns are used; but patrolling is difficult and ideal management almost impossible.

Contour irrigation and the Kook system are the only methods which can give reasonably even distribution of water in narrow strips of soil, as needed in young orchards.

Assuming that any of the above methods are used for their main purpose—to provide efficient irrigations of 3 to 4 inches of water, such as the trees might be expected to require on Mildura citrus soils—then one important fact will have to be borne in mind. Because of the rigid roster system, and the lengthy periods when water is not available, the trees would almost certainly wilt between irrigations, the spacing of which is often suited to vines, but much too far apart to permit good health in and wise irrigation of citrus trees. Under present conditions citrus growers are, for the most part, grossly overwatering in an effort to tide their trees over the long intervals between certain irrigations.

Should a very real saving in overall water consumption be shown on the Departmental plots under spray irrigation at Mr. J. H. Ramsay's citrus grove, Redcliffs, where the privilege of extra experimental waterings has been granted, then consideration would doubtless be given to special rosters for those efficiently employing spray or contour irrigation.

Journal of Agriculture, Index for 1947

Copies of the Index of the *Journal of Agriculture* for 1947 may be obtained, free of charge, on application to the Stores Branch, Department of Agriculture, Melbourne, C.2.



Cereal Investigations in the Wimmera

The following account of experimental work conducted at the Longerenong Agricultural College, and the discussions on the results obtained, were prepared by Mr. B. F. McKeon, B.Agr.Sc., District Agricultural Officer. This article, together with other material, has been included in a guide book which is available for general distribution and for the information of visitors to the Station.

Results at Longerenong College and Other Centres

THE Cereal Experiment Station conducted by the Department of Agriculture at the Longerenong Agricultural College is the main research institute in the Wimmera district for the investigation of problems associated with wheat farming in that area. The college is located at Doon, eight miles east of Horsham.

With its black fertile plains especially adapted to wheat growing, the Wimmera is noted for its high productive capacity. This district normally produces about 40 per cent. of the Victorian wheat crop. During the past decade, the annual wheat production in the Wimmera was $13\frac{3}{4}$ million bushels, representing an average yield of 16.4 bushels per acre. In favourable seasons, yields of 40 bushels per acre are not uncommon on many farms in this area. The annual rainfall at Longerenong College is $16\frac{1}{2}$ inches (average 55 years), of which 9 inches are normally received in the growing period of the wheat crop, from June to November

inclusive. The plots are located on strong clay loam, typical of the black soil of the Wimmera plains.

The experimental work at this station commenced in 1907, and, in the early years, was confined mainly to the breeding and development of wheat varieties. Permanent field tests were first established in 1912, and, from time to time, the experiments have been extended and new investigations, including variety, manurial, rotation, and soil cultivation trials have been introduced. At the same time, the methods of experimentation used in the field have been modified in accordance with the latest scientific advances.

At the present time, 194 acres are devoted to the experimental work, which embraces investigations on all the main features associated with wheat farming in the Wimmera. The experiments and demonstrations at Longerenong College have been of material assistance in providing information on problems involving the maintenance and improvement of wheat production in the

Wimmera. Valuable results have been obtained to date, but many problems remain to be solved. The following report outlines the investigations in progress with wheat, oats, and barley, and summarizes the results of the tests in past years. In addition to the work at this station, subsidiary experimental plots are conducted by the Department of Agriculture at six other centres in the Wimmera, namely Salisbury, near Nhill (on the property of Mr. E. W. Dahlenburg), Kaniva (Mr. W. J. Crouch), Warracknabeal (Mr. A. C. McKenzie), Donald (Messrs. D. Dunstan and Sons), and Charlton (Mr. W. O'Connor).

INVESTIGATIONS IN PROGRESS

The total area sown with plots at Longerenong in 1947 was 110 acres, comprising some 700 individual plots and 400 single rows. The investigations in progress are as follow :—

1. Permanent Rotation Trials :—

- (i) Investigations with eleven rotation systems with wheat as the principal crop ;
- (ii) Supplementary Rotation Trial (replicated)—to study the influence on soil fertility of (a) burning of stubble, (b) ploughing-in stubble, (c) inclusion of a two-year period under pasture.

2. Wheat Variety Trials :—

- (i) Senior trial with six standard wheats and five new crossbreds and selections ;
- (ii) Junior trial with 66 promising crossbreds, selections, and varieties introduced from other States.

3. Oat Variety Trial—eight varieties.

4. Barley Variety Trial—three varieties.

5. Cereal Grazing Trial—to compare the hay and grain yields on grazed and ungrazed plots of two wheat and four oat varieties.

6. Fallow Cultivation Trials :—

- (i) Replicated test with eight treatments .
- (ii) Residual trial on site of previous tests.

7. Fertilizer Trials with Wheat :—

- (i) On permanent site—twelve treatments ;

- (ii) On changing sites—including tests with various zinc containing compounds and with manganese and molybdenum.

8. Milling and Baking Quality Investigations with Wheat :—

An intensive study is being made of the influence on milling and baking quality of such factors as variety, rotation system, soil fertility, fertilizer treatment, and time of sowing.

9. Cereal Breeding and Seed Production :—

- (i) Stud Rows—approximately 400 single rows of wheat, oats, and barley ;
- (ii) Seed Production Plots—to provide seed supplies for experimental plots and bulk areas.

LAY-OUT OF THE EXPERIMENTS

In order to overcome soil variations in the paddock, many of the above tests are conducted under a replicated system of plots known as the Randomized Block method. By this system, a small plot of each variety or treatment is sown side by side to form a block. The block is repeated (or replicated) usually four times, and the yields of each treatment are obtained by averaging the yields of the four individual plots. The order of the treatments in each block of plots is randomized, that is, they are not arranged in the same sequence. The replicated system of experimentation has a higher degree of accuracy than the simpler method of testing by single plots.

In view of the effect that varying factors, such as time of sowing, rate of seeding, or manuring, may have on the results of a trial, it is of interest and importance that these factors should be given due consideration. Accordingly, in some of the trials, where such information was required, the experimental layout was modified along these lines and a number of composite trials, incorporating varying factors, was sown. This improved method of experimentation is a modification of the randomized block method and is known as a Factorial Design.

SEASONAL CONDITIONS AT LONGERENONG

The season opened with particularly good early rains during March, when over 3 inches were recorded at Longerenong. However, following autumn rains failed,



Visitors inspecting plots at Longerenong Field Day, 1946.

and oat crops were sown dry during late April and May. The abnormally dry conditions continued until the end of June, when soaking rains relieved the position and enabled seeding of the main wheat crop to proceed during July. Showery weather during that month further delayed the cropping programme.

RAINFALL RECORDS—LONGERENONG COLLEGE.

Month.	1944.	1945.	1946.	1947.	Average 55 Years.
January ..	44	93	221	13	95
February ..	34	486	323	71	92
March ..	3	3	192	325	94
April ..	147	3	35	64	130
May ..	155	72	105	20	172
June ..	6	266	164	214	187
July ..	104	140	292	249	161
August ..	2	232	99	129	164
September ..	31	77	65	217	157
October ..	151	88	93	244	161
November ..	42	80	49	72	104
December ..	160	55	77	216	116
Total points	879	1,595	1,715	1,834	1,633

Germination was generally good, but crops made slow growth during the cold and wet conditions which prevailed during August and early September. With the advent of warmer temperatures together with splendid rains in October, crops developed well and showed promise of heavy yields. However, following further rains accompanied by humid conditions in the late spring,

wheat crops were attacked by rust, the degree of infection at Longerenong varying from relatively light to moderate. Consequently, earlier yield prospects will not be realized, but it is probable that the relatively cool and long ripening period which has been experienced will benefit rust-affected crops and enable reasonably good yields to be attained at the College this year.

RESULTS OF EXPERIMENTS

WHEAT VARIETY TRIALS

The varieties under test in the wheat variety section are reviewed each season, and new wheats are included from time to time to replace those discarded on account of their lower yielding ability or other inferior characters. In recent years, several new crossbreds, which have been prominent in preliminary tests, have been promoted to the main trials. Special attention is paid to varieties possessing superior flour quality, and some of these have also been included.

In the Senior Variety Trial eleven wheats were under replicated test in 1947, namely, Quadrat, Pinnacle, Ghurka, Magnet, Insignia, Diadem, and five crossbreds and selections.

A series of Junior Variety Trials is conducted also, in which more recent crossbreds and selections, together with varieties introduced from other States, are subjected to replicated testing. The best of the wheats in this section will be promoted to



Typical heads of Pinnacle.

the Senior Trial for further testing against standard varieties and more advanced cross-breds.

The variety trials were sown in 1947 early in July, with 75 lb. of seed and the equivalent of 1 cwt. of 22 per cent. superphosphate per acre. The average yields

obtained in past years in the tests at Longerenong, together with the results at other centres in the Wimmera, are set out in Table 1.

PROMINENT WHEATS IN THE WIMMERA TESTS

Pinnacle

This new wheat, which was released in 1946, is a selection from Pindar, made by the former Cerealist of the Department, Mr. G. S. Gordon. Pinnacle is a midseason variety, very similar in appearance to Ghurka, but slightly taller than that variety. Like Ghurka and Quadrat, it is highly resistant to flag smut disease, and possesses good harvesting characteristics. In flour quality, it is superior to the parent variety, Pindar, which itself was a marked advance on Ghurka.

The production of Pinnacle marks a distinct advance in the objective of improving not only the prolificacy, but also the grain and flour quality of Victorian wheat.

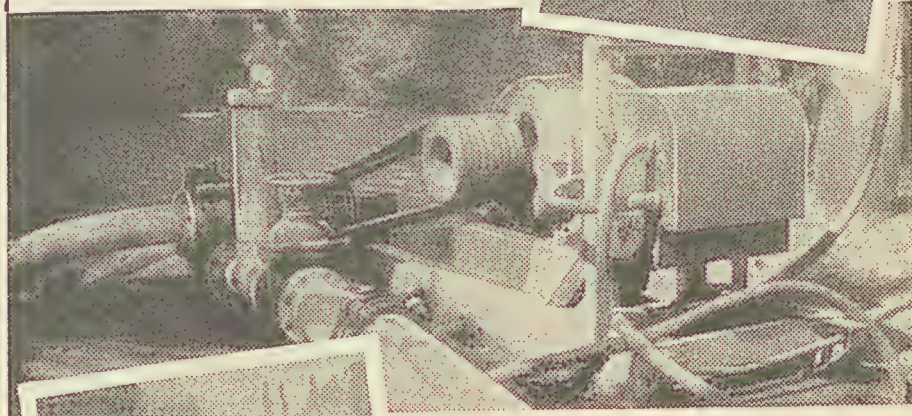
Pinnacle should be a very suitable variety for the Wimmera plains, since it has given better results than either Quadrat, Magnet, or Ghurka in five years of replicated tests at Longerenong. Its average yield in these trials for five seasons (Table 1) has been 30.5 bushels per acre, compared with Quadrat 29.1, Magnet 28.5, and Ghurka 26.4 bushels per acre.

TABLE 1.—WHEAT VARIETY TRIALS IN THE WIMMERA.
(Average Yields in Bushels per Acre.)

Variety.	Longerenong. (Black Land.)			Salisbury. (Black.)		Kaniva. (Black.)	Donald. (Black.) (Red.)		Charlton. (Choco-) late.)	Warrack-nabeal. (Red Loam.)
	7 Years, 1939-41, 1943-46.	5 Years, 1941 and 1943-46.	4 Years, 1943-46.	6 Years, 1941-46.	4 Years, 1943-46.	5 Years, 1942-46.	2 Years, 1940-41.	3 Years, 1938-39, 1946.	5 Years, 1942-46.	3 Years, 1940-41, 1946.
Quadrat	31.6	29.1	29.7	33.5	28.7	40.3	15.7	26.4	19.8	21.7
Pinnacle	..	30.5	31.4	33.1	28.0	41.4	..	..	19.5	..
Diadem	32.0	28.4	29.1	30.0	26.1	36.7	..	..	20.0	21.5
Magnet	30.5	28.5	28.0	33.2	28.1	42.3	14.7	27.3	19.4	20.6
Ghurka	29.2	26.4	27.1	31.3	26.2	37.0	15.6	26.2	18.5	20.1
Bencubbin	..	..	..	..	..	..	15.4	28.1	18.2	21.4
Pindar	29.9	27.4	28.2	31.7	25.8	39.7	16.0	24.1	18.9	20.5
Insignia	..	..	26.7	..	24.4	..	..	..	22.1	..

NOTE.—The yields per acre quoted in this report are those actually harvested from the plots. Such yields are considerably higher (up to 20 per cent.) than would be the case if it were not necessary to have paths between the plots.

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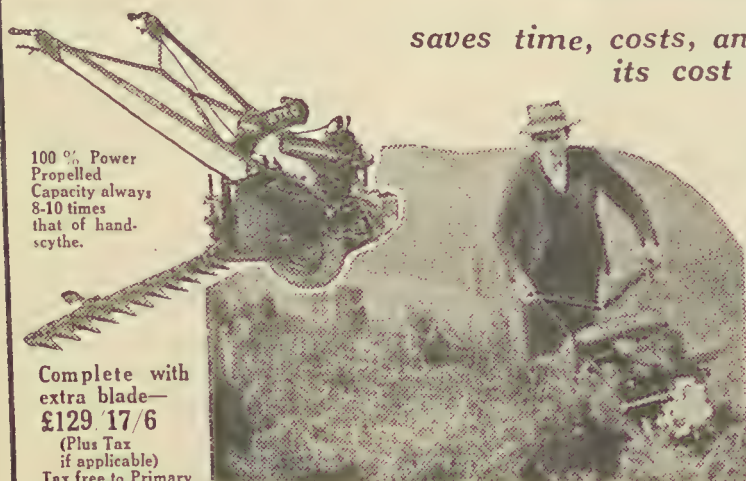
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In the West Wimmera at Salisbury, Pinnacle, during six seasons, has given slightly higher yields than Magnet and Quadrat, but, at Kaniva, although Pinnacle has returned a slightly higher average yield than Quadrat over five years' tests, it has not yielded quite as well as Magnet at this centre. At Charlton, Pinnacle has returned approximately the same average yields as Quadrat and Magnet.

Quadrat

For several years this popular variety, which was developed from a cross made between Ghurka and C.M.G., has shown outstanding yielding ability in the Wimmera, particularly on black land. Quadrat is now the leading variety grown in Victoria, and is also the principal wheat grown in the Wimmera, occupying some 48 per cent. of the area sown to wheat in that district last season.

Quadrat, which is a free-stripping, brown-chaffed wheat, with a strong straw, slightly taller than Ghurka, was bred at the State Research Farm, Werribee, and subsequently developed in the departmental plots at Longerenong College.

Diadem

This wheat (formerly the crossbred Ghurka × White Fife) was developed at the State Research Farm, Werribee, and Longerenong College, and combines the prolificacy of Ghurka with the high flour quality of White Fife. Departmental and semi-commercial tests have shown that Diadem is a medium-strong wheat producing a flour of relatively higher baking quality than Ghurka, Magnet, or Quadrat.

Regarding the yielding ability of Diadem, the experimental results are limited owing to the reduced number of testing centres during the war period. However, the results in Table 1 show that Diadem has given particularly promising yields at Longerenong, where it is the leading variety over seven years' tests, but, at other centres, it has not been so outstanding.

Diadem was grown for seed by a number of selected growers in the past season, for which undertaking a subsidy of 3d. per

bushel is being paid by the Department of Agriculture from funds provided by the Victorian Millowners' Council. Growers desirous of obtaining Diadem seed for sowing in 1948 are advised either to make arrangements direct with a farmer who has multiplied the seed in the district, or write to the Department of Agriculture, Melbourne, C.2, or the Principal, Longerenong Agricultural College, Dooen.

Ghurka

This variety, which has been a very popular Wimmera wheat for many years, has given high grain yields on all Wimmera soils. In more recent years, however, a number of the newer varieties have proved more prolific in yield than Ghurka, and some produce flour of better baking quality than this variety. Ghurka is a free-stripping wheat with a short, strong straw and is resistant to flag smut. Under some circumstances, however, its short straw is a disadvantage; for example, where the variety is required for hay, or on areas where tall-growing weeds are troublesome.



Heads of the new variety, Diadem.

Magnet

Also produced by the Department of Agriculture, Magnet was approved by the Victorian Wheat Advisory Committee for release in the Wimmera, particularly as a variety to replace Free Gallipoli.

In tests on black land at Longerenong, Salisbury, and Kaniva, Magnet has returned high yields over an extended period, and has given good yields on Wimmera red soils also. Magnet is also a useful wheat for hay purposes.

Baldmin

An early-maturing, white-chaffed variety of medium-strong flour quality, Baldmin has yielded well in tests in the Wimmera plots over several years. The straw of this variety is of a brittle nature and tends to break readily during harvesting, causing inconvenience through "choking". Baldmin is best handled with a header and should be harvested promptly.

Other Varieties

Insignia, Bencubbin, and Pindar are three prominent wheats in the Mallee tests. However, they have not been outstanding in tests on Wimmera black land, and appear to be better suited to the red soils. They should prove useful on the "fringe" country in the northern section of the Wimmera.

Insignia, which is a cross between Ghurka and Rancee, was bred by the Department of Agriculture as a variety especially suited to Mallee conditions, and was distributed in 1946 from the Mallee Research Station, at Walpeup. Insignia is earlier maturing than either Ghurka or Rancee, has a short, strong straw slightly taller than Ghurka, and stands better than most early types. Like Ghurka it is resistant to flag smut and is less susceptible to rust than Rancee. Insignia has a brown chaff, and has proved easy to thresh at harvest, producing a medium-sized grain with flour at least equivalent in baking quality to its Rancee parent and superior to Ghurka and Quadrat.

Bencubbin has returned good yields in tests on the red and mixed Wimmera soils, and, with its tall straw, is a useful dual-purpose variety (for grain and hay) on these areas. Pindar, which was developed from a selection made from Ghurka at the State Research Farm, Werribee, has become a

popular variety in the Mallee. It has good harvesting characteristics and in flour quality is much superior to Ghurka. Pindar grain is plump and very attractive.

The wheats recommended for the Wimmera by the Victorian Wheat Advisory Committee are as follow:—

Wimmera black plains—

Pinnacle, Quadrat, Magnet, Diadem*.

Wimmera red and "fringe" soils—

Quadrat, Magnet, Pinnacle*, Diadem*, Insignia*, Bencubbin.

* Recommended for trial pending further evidence.

The main varieties now grown in the Wimmera, together with their percentage of the total area at intervals over past seasons, are listed in Table 2.

TABLE 2.—TEN PRINCIPAL WHEAT VARIETIES SOWN IN THE WIMMERA.
(As estimated by the Government Statist.)

Variety.	Percentage, 1947-48.	Percentage, 1941-42.	Percentage, 1938-39.	Percentage, 1936-37.
Quadrat ..	56.4	0.4	..	..
Magnet ..	16.6	4.2	..	..
Ghurka ..	12.5	63.3	63.2	60.1
Pinnacle ..	3.2	..	..	..
Pindar ..	3.0	..	..	..
Bencubbin ..	2.0	2.9	1.2	1.1
Rancee ..	1.6	9.6	7.6	10.6
Regalia ..	1.1	1.2	..	..
Dundee ..	0.7	6.7	12.3	4.2
Bobin ..	0.7	2.8	0.7	0.5
Total Acreage	1,006,082	946,318	910,684	772,382

TIME AND RATE OF SEEDING TESTS WITH WHEAT

Time and rate of seeding tests with wheat, which were conducted over a period of 22 years from 1914-35, included five rates of seeding ranging from 45 to 120 lb. per acre. The plots were sown in duplicate, one section being cropped early in the season (late May to early June) and the other several weeks later (July), thus affording a comparison between early and late sowing.

There are several points of interest arising from the results of this experiment:—

1. Despite the relatively long seeding period which is possible on Wimmera black ground, due to favourable soil

texture even in mid-winter, it is desirable to sow as soon as possible after the middle of May consistent with clean crops being obtained.

2. When early sown, but small differences in yield are obtained over the whole range of the five seeding rates 45 to 120 lb. per acre; 60 to 70 lb. being a most suitable quantity to use.
3. As the time of seeding becomes later the rate of seeding may profitably be increased, though not above 90 lb. per acre.

The average yields obtained over the period of the test are shown in Table 3.

TABLE 3.—TIME AND RATE OF SEEDING TESTS.

Rate of Seed per Acre.	Average Yield 22 Years, 1914-35 (Bushels per Acre).		
	Early Sown (Late May, Early June).	Late Sown (July).	Difference in Favour of Early Sowing.
45 lb. ..	40.3	34.6	5.7
60 lb. ..	41.0	37.2	3.8
75 lb. ..	40.7	37.4	3.3
90 lb. ..	40.8	38.3	2.5
120 lb. ..	39.1	37.8	1.3
Average ..	40.4	37.1	3.3

In 1938, a new Time of Sowing Test was commenced to compare the yield of five varieties each sown at two periods, normal

and late. The effect of the manurial dressing in relation to time of sowing is also being studied in this trial, each variety being sown with 1 cwt. and 1½ cwt. of superphosphate per acre. This test was discontinued in 1942 owing to the war, but it will be re-established as soon as possible.

In 1938 and 1939, five varieties were included, namely, Ghurka, Baldmin, Nizam, Free Gallipoli, and Federation, the late section being sown about one month after the normal sown plots. In 1940, Nizam was eliminated from the trial, and, in 1941, Magnet was added to the varieties under test.

In regard to time of sowing, the yields from this test to date, confirmed results obtained in the previous trial, and the reduction in yield (in bushels per acre) due to late sowing, was as follow :—Baldmin 8.9, Free Gallipoli 6.9, Ghurka 4.2, Nizam 3.6, Federation 0.7. Further investigation is necessary, however, before definite conclusions can be drawn as to the effect of the manurial dressing on each of the varieties in relation to time of sowing.

WHEAT GRAZING TRIALS

A wheat grazing trial was commenced in 1936 to determine the effect on yield of grazing the wheat crop with sheep in late winter, and to compare the behaviour of



Sowing experimental plots at Warracknabeal.

different varieties under grazed and ungrazed conditions. Since the rate of seeding has an important effect on the feed produced, this feature was also incorporated in the trials, and each variety was sown at three rates of seed, 60, 90, and 120 lb. per acre. A uniform application of superphosphate, 1 cwt. per acre, was used throughout the test.

In 1937, the variety, Wannon, was replaced by Baldmin, and, in 1939, Magnet was included with the varieties under test. In each of the first three years, the grazed section was fed off on two occasions during late winter. In 1939, owing to extremely wet conditions in August, one grazing only was obtained, the plots being fed off early in September. In 1940, the grazed plots were fed off heavily on 20th to 22nd August, and, in 1941, on 12th and 13th August.

The results of the tests since 1936 are summarized in Table 4. To simplify the table, the actual yields from the grazed and ungrazed plots have been omitted, and the decrease (or increase) in yield recorded each season due to the grazing is shown. The figures are the average of the three rates of seeding.

In reviewing the experiment to date, it will be noted that in the four years 1936, 1937, 1939 and 1941, there was a decrease in yield with each variety tested, due to grazing. For example, with Ghurka the reduction was 7.3, 5.1, 5.9 and 5.5 bushels per acre in those years.

TABLE 4.—WHEAT GRAZING TRIALS.

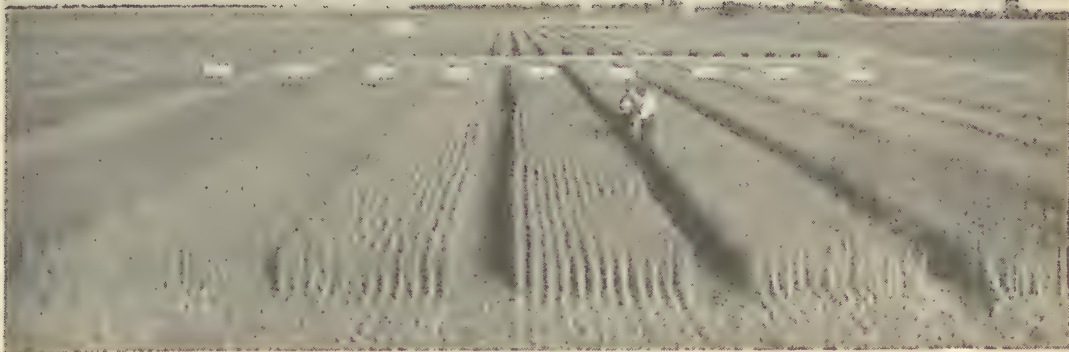
Effect of Grazing on Grain Yield—Showing Decrease (or Increase) due to Grazing. (bus./ac.)

—	1936.	1937.	1938.	1939.	1940.	1941.
GHURKA.						
Decrease ..	7.3	5.1	0.6	5.9	..	5.5
Increase ..	..	..	..	..	5.3	..
BALDMIN.						
Decrease ..	..	8.8	..	15.2	..	5.1
Increase ..	..	..	2.3	..	3.3	..
FREE GALLIPOLI.						
Decrease ..	4.4	0.4	..	12.8	..	..
Increase ..	..	..	0.9	..	..	..
MAGNET.						
Decrease ..	..	..	..	5.3	..	4.2
Increase ..	..	..	..	..	8.5	..

In the dry seasons, 1938 and 1940, however, the grazed plots generally returned a higher yield, particularly in 1940, when the



Sheep on experimental grazing plots at Longerenong.



Cereal plots in the Nhill district.

increase was very marked with each variety. In that season, the grazed plots, being later in maturity, benefited from the late spring rains, to a greater degree than the ungrazed crop. The packing of the soil by the sheep in this drought year may also have been a contributory factor towards the higher yields on the grazed plots.

Comparing the varieties under test, Baldwin, in most years, was affected by the grazing to a greater extent than the other wheats. In regard to the results with the different rates of seeding, the evidence over the full period indicates that, with each variety, the loss in yield was generally lowest in the plots sown with the heaviest amount of seed (120 lb./ac.).

Wheat grazing trials have been conducted at Salisbury also, and, in these tests over six years, a reduced yield (averaging 2·3 bush./ac.) due to the grazing occurred each season.

The evidence from the grazing trials shows that the effect of the grazing varies according to the particular season, and that, generally, a reduced wheat yield is likely to occur following the feeding off. The value of the feed obtained, and other factors, however, have to be considered in deciding whether or not the grazing is desirable.

A new grazing trial was commenced recently at Longerenong to furnish information on the effect of grazing on the hay and grain yields of four oat varieties and two wheats. The following are the varieties included in this test:—

Oats—Algeribee, Dawn, Mulga, Orient.

Wheat—Quadrat, Magnet.

The results obtained to date in this trial are inconclusive, and further tests over a number of seasons will be necessary before definite conclusions can be drawn.

The second portion of this article dealing with wheat manurial, mineral deficiency and pickling trials, etc., will appear in a subsequent issue of the Journal.



WILD TURNIP — A SERIOUS MALLEE WEED

By H. J. SIMS, M. Agr. Sc., B. Com., Cerealist

DURING the past few years, Wild Turnip (*Brassica Tournfortii*) has spread rapidly through the Victorian Mallee. Prior to 1942, this weed was confined chiefly to the more westerly parts of the Mallee, but in the past four or five years it has become very widespread. Its prolific seeding and "tumbling" habit facilitate its spread, and the danger of this weed in wheat-growing districts is now widely recognized.

An article by Gardner and Throssell, published in the Western Australian Journal of Agriculture ⁽⁷⁾ provides some interesting information on the introduction of wild turnip into Australia. These writers state that wild turnip is sometimes incorrectly called roly-poly. The circumstances attending its introduction to Western Australia can only be surmised, but it would appear that the weed first obtained a footing there about 1914 when stock feed was imported from overseas during a period of drought.

For about ten years after its introduction, wild turnip made little progress—or it may have escaped notice due to a certain similarity in appearance to wild radish, mustard, and other cruciferous weeds.

The first official recognition of the weed was made in 1928, when a complete plant was received from the Manager of the Merredin Experiment Farm. As the plant had not been recorded in Australia before, the specimen was forwarded to the Kew Herbarium (England) for the checking of its identification—*Brassica Tournfortii*. During 1929 and 1930, its spread through the agricultural areas of Western Australia was rapid, the chief means of spread from district to district having been by means of chaff from affected areas.

The first record of the appearance of wild turnip in South Australia was made in 1936 at Barton, on the east-west railway ^(2,4).

In the following year, it was reported in the Murray Mallee. This discovery led to investigations being made, as a result of which it was ascertained that the plant had been growing at Sandalwood as far back as 1928, and since that year had been spreading throughout the Mallee, particularly on the ironstone soils, which it is said to favour.

Kroehn ⁽⁹⁾ states it is believed that wild turnip was introduced into the Mindarie district in 1926, and that many settlers would be compelled to leave their holdings if some control were not introduced. To-day it is estimated that over one hundred thousand acres in South Australia are infested with this weed.

In Queensland, wild turnip has been present as a weed of winter cereals on the Darling Downs for some years ⁽⁶⁾ but its spread has been rapid in the last few years. Winders ⁽¹⁶⁾ states that its prevalence in 1945 caused alarm to farmers. The infestation was so dense that, despite efforts to control it, most farms in the heavily infested districts, and many farms previously clear of the weed will be seriously troubled in the future.

Wild turnip was gazetted as a noxious weed in Victoria in 1934. It was not until 1936 and 1937, however, that its spread became serious. The two first centres of the establishment of the weed were the Murrayville and Rainbow-Yaapect districts. In 1943, Bond ⁽³⁾, reported north of Hopetoun "the extreme abundance near all cultivated land of *Brassica Tournfortii* ("Mediterranean



[After *Sth. Aust. Jnl. Agr.*]

A single plant of the Wild Turnip (*Brassica Tournefortii*). The illustration indicates the natural habit of the weed. Seed pods closed and open, are shown in the lower right-hand corner of the picture.

Mustard") which has become a serious weed in the north-west of Victoria in recent years. Despite vigilance by Noxious Weeds Inspectors when the plant first made its appearance, its spread has been rapid, and to-day it is widespread in all parts of the Mallee. In each district, this plant appears to grow most vigorously on the lighter and sandier soils.

DESCRIPTION OF THE PLANT

The first leaves of the plant are smooth and heart-shaped, but these are quickly succeeded by hairy leaves with a diameter ranging from 9 to 24 inches. They cover the ground in the form of a rosette.

In its initial stage wild turnip may be confused with Mustard (*Sisymbrium orientale*), but it is more vigorous than the latter, and the leaves are much more hairy. The stems of mustard are leafy, in comparison with the bare stems of wild turnip. The upright growth is coarse and hard, and is practically devoid of leaves. It is usually from 2 to 3 ft. tall, but can grow to 6 ft. The flowers are a paler yellow than mustard and the seed pods bigger containing 10 to 22 globular seeds, which although small, are much bigger than the dark purplish mustard seed. Wild turnip ripens earlier than mustard, and when ripening and as a mature plant, is much lighter coloured than the latter.

Seeds of wild turnip will germinate at any time of the year when sufficient moisture is present, and the plant develops so rapidly that under favorable conditions it may set seed within a month of germination. In the Murrayville district in late spring, plants have flowered within a fortnight of cutting to ground level.

It is a vigorous seeder, and a large proportion of the seeds have a hard coat. A sample of seed from Underbool, collected in February, 1946, was tested for germination in the Departmental Seeds Laboratory, and gave a 17 per cent. germination in three days, 19 per cent. in ten days, while there were 75 per cent. of hard seeds—seeds which had not germinated, but appeared fresh though the seed coats had absorbed water and become mucilaginous. A sample pre-chilled at 4° C. for four days gave 5 per cent.

germination in three days and 5 per cent. in 10 days. The remainder of the seeds appeared fresh but the seed coats had absorbed water and become mucilaginous. This character of hard seededness greatly increases the difficulty of eradicating the plant once it has been allowed to seed.

WILD TURNIP AS A WEED

The characteristics that render wild turnip objectionable include the fact that it has a robust, spreading rosette stage which crowds out other plants. It is not usually readily eaten by stock although, when upright growth is commencing, the "heart" of the plant may be eaten out, particularly if there are only isolated plants in a paddock. Its free-seeding habit and quick maturity enable it to spread rapidly. A most objectionable feature of the plant is its tendency when ripe to break off at the ground level and be blown along the ground for considerable distances. This feature brings about widespread distribution of the seed, and is a most important factor in the rapid spread of the weed.

The characteristic of the plant to break off at ground level is particularly objectionable in cereal crops. The wild turnip plants ripen before wheat, and after breaking off they are carried by the wind and roll over the top of the crop, broadcasting seed in transit. These plants, on the top of the crop, are particularly difficult to deal with by harvesting machinery and are carried in front of the comb in such a position that they cannot be reached by the choke-cutter. Plants growing in the crop also break off when the front of the comb touches them, and cause similar chokes. Some farmers cope with these chokes by shortening the teeth of the header comb.

Tumbling plants often come to rest against fences or in channels, and serve as traps for the accumulation of drifting sand. In the 1945 season, the State Rivers and Water Supply Commission experienced difficulty in supplying water in the Patchewollock channel due to the plants collecting in the channel and completely blocking it on several occasions ⁽¹¹⁾.

METHODS OF CONTROL

A most important factor in the control of any weed is the ability of the farmer to recognize it speedily. Therefore, if any doubt exists, specimens should be submitted to either the local Lands Inspector, officers of the Mallee Research Station, or to the Agricultural Superintendent, Department of Agriculture, Melbourne, C.2.

In a district where infestation is only light, every effort should be made to prevent the plants from seeding; however, in most parts of the Mallee this weed is past the stage where it can be handled by pulling or hoeing patches of plants.

Scott ⁽¹³⁾ states that no way of eradicating wild turnip has been discovered as yet, but on farms where fencing and water supplies permit, it can be kept under control by widening the cropping rotation and grazing the infested area. He also considers wild turnip is essentially a cropping weed which follows tillage, and that when cereal planting is discontinued, the stand quickly becomes less dense. Scott points out that wild turnip provides fodder which, although not particularly palatable, is often eaten by animals.

Experience throughout the Victorian Mallee has shown, unfortunately, that wild turnip is not confined to cultivation land, and that thick stands have occurred on neglected and marginal lands. Probably the fact that, during the drought, much of

this land was bare and subject to drift, provided the necessary conditions for the establishment of the plant. Such areas are a serious threat to adjacent ones which are relatively free from the weed, or where the owners are taking measures to eradicate what plants are present.

In wheat growing districts the most practicable method of control appears to be by cultural operations ^(5, 7, 8, 9, 16).

It is suggested that, after the land has been fallowed, any young plants making their appearance should be destroyed by cultivation and, to do this, thorough working is essential. The amount of cultivation to be given will be governed by the liability of the land to erosion. Where the plants are not sufficiently numerous to warrant cultivation, they should be hoed or hand-pulled and thus many hours of labour can be avoided at a later stage.

Plants pulled after reaching the flowering stage should be removed from the area and either burnt or buried deeply. Wild turnip has the ability to set seed under most adverse circumstances, and plants pulled while quite green have been known to set seed. Sheeping the fallow and handpulling, where necessary, can replace some cultivation, particularly where soil moisture conditions render cultivation unwise from the soil erosion viewpoint.

As the wind will blow mature plants from one part to another, every effort should be made to eradicate plants as soon as they appear on the farm. Plants blowing on to fences should be collected and burnt.

Seeding operations should be delayed until after the advent of seeding rains. In areas where infestation is bad, it is advisable to cultivate after the rain, and not commence sowing until at least a week after cultivation, so as to kill at the seeding operation any seedlings that have



"Tumbling" plants frequently come to rest against fences or in irrigation channels, serving as traps for drifting sand.

germinated. Much trouble can be saved at harvest time if the plants which were not killed by cultivation are handpulled.

The use of the selective weedicides that are now available offers another possible means of control (⁵, ⁸, ¹⁰, ¹², ¹⁴, ¹⁵). Some of the commercial hormone-like weedkillers have been tested at the Mallee Research Station, and have given a complete kill of young plants of wild turnip and mustard, while not affecting the cereal crop. When older plants were treated, these substances prevented the formation of seed, while similar plants, which were hand-pulled at the same time set quite a number of seeds. However, the cost of application together with the cost of the spray, make their use very expensive.

In Western Australia it has been found that secondhand bags have played an important part in spreading wild turnip seed from one farm or district to another (¹). By dipping the bags into boiling water or into a 5 per cent. bluestone solution, any seeds enmeshed in the bags will be effectively killed.

Cereal crops have the ability to smother many weeds, but wild turnip usually grows too fast to be controlled this way in a wheat crop. Kroehn (⁹) considers that the only cereal that will completely smother wild turnip is rye.

SUMMARY

Wild Turnip was first recognized in Western Australia in 1928, but was probably introduced in fodder during or immediately after the 1914 drought.

Although it was not officially recognized in South Australia until 1936, it had apparently been present in the Murray Mallee since 1926 or 1928.

Wild Turnip was gazetted as a noxious weed in Victoria in 1934 and has spread rapidly during the past few years.

A description of the plant is given.

Its chief objectionable characteristics are the difficulty it causes in harvesting wheat; the fact that it displaces practically all other vegetation on an area and is not a good fodder; its "tumbling" habit, which is an effective means of spreading the seed; it has caused difficulties in the delivery of water in stock and domestic channels by blocking the channels.

Methods of control are clean fallowing; later sowing, killing the seedlings before the crop is sown; handpulling or cutting plants where possible; leaving the area out to grazing; the use of selective weedicides is a possible, though expensive, means of control on small areas.

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IN THE GARDEN

By T. H. KNEEN, B.Agr.Sc.,
Principal, School of Primary
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Burnley Gardens.

HYDRANGEAS

MANY beautiful displays of hydrangeas have been seen this summer in both private and public gardens. The intense blues and pinks of modern varieties, the new and varied flower forms, and the greater range of plant size varying from less than 2 feet in height to 6 or 8 feet, have increased the well-deserved popularity of this useful shrub.

Hydrangeas belong to the family *Saxifragaceae* which includes another popular group of plants—the *Saxifragas*. There are more than 30 species of hydrangea, varying a great deal in their hardiness, but only one species, *H. macrophylla*, is widely grown in Victoria. This was previously known as *H. hortensis*. Another synonym, *H. opuloides*, is rather more descriptive of the species as “*opuloides*” means “resembling snowball tree”. Another well-known species is *H. paniculata* var. *grandiflora*, the initials p.g. having become written as “Peegee”.

There are many horticultural varieties of *H. macrophylla*. One of the most striking features is the variation in colour obtained with most of them according to the reaction of the soil in which they are planted. Intense blues are seen in acid mountain soils while the natural pinks and reds predominate in circum-neutral soils. Most gardeners are aware that the colour can be changed from blue to pink by the use of lime, or, on the contrary, from pink to blue by using patent “blueing powders”



which primarily alter the soil reaction to an acid condition. It should be borne in mind, however, that many varieties are more suitable for “blueing” than others, and some discrimination should be exercised in choosing varieties for this purpose.

Naturally, nurserymen do not, as a rule, guarantee the colours but will assist purchasers to make a suitable selection according to their needs.

The true flowers of hydrangeas are small, generally sterile, the enlarged sepals of the flowers being the showy parts. The sepals vary a good deal in shape and size according to variety, many being much serrated. *H. macrophylla* var. *maculata* is distinctive, as only the outermost flowers in the cluster bear enlarged sepals; the others are quite inconspicuous. Perfect specimens of this variety are most attractive. In some varieties the sepals are rounded and cupped, giving a quite distinctive appearance.

In Victoria, partially-shaded positions, particularly with an easterly aspect and affording protection from frosts, are favoured

[continued on page 89.]

THE VEGETABLE GARDEN

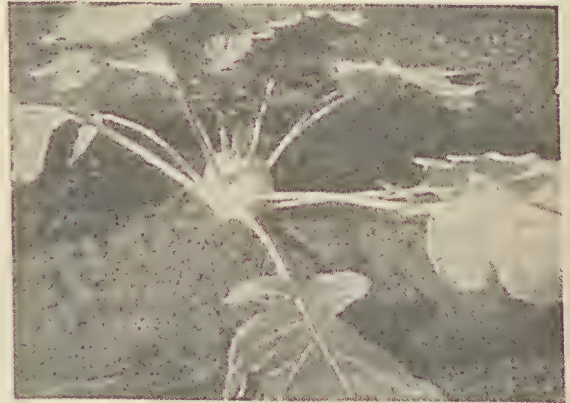
By GEORGE HYAM, Horticultural Supervisor

AUTUMN PEA CROPS

IN all except the cooler districts on the highlands, good crops are obtained from peas sown in early February, although in most districts irrigation is necessary to carry them through the heat of the summer. Peas do well following potatoes, onions or lettuce that have just been harvested, and the peas in turn, can be followed by cabbage, or other leaf vegetables in June. In districts where early frost may occur, the best variety to sow now is the Melbourne Market (William Massey) as it has a shorter growing season; in other districts, Greenfeast can be sown if well watered, but the vines of the Yorkshire Hero will stand drier conditions better. For autumn planting, sow in drills 15 to 18 inches apart in soil that has been well watered 24 hours previously. If possible run the rows north and south. The best fertilizer on most soils is superphosphate used at the rate of 1 oz. per yard of row. This is best applied each side of the row, 2 inches away from the seed and 2 inches below the surface. Either at the time of sowing or when the plants come through the surface, some light brushwood sticks should be inserted to give the plants protection from strong winds. Such support will improve the yield.

TURNIPS AND SWEDES

The first sowing of white turnips can be made in February, but it is best to sow short rows at any one time, sowing successively at intervals of a month in March and again from July to September. Unlike other root crops, turnips will benefit by some nitrogenous fertilizer, the best to use being superphosphate and sulphate of ammonia (4 : 1) at the rate of 1 oz. to the square yard. White Stone, White Egg or Orange Jelly (Golden Ball) are some good garden varieties. Sow in drills 12 inches apart and thin the plants to 4 inches apart, when they grow their second pair of leaves. A much larger sowing of swedes can be made for winter and spring use as they store well in or out of the ground. Using the same fertilizer,



Kohl-rabi (Turnip-Rooted Cabbage) has a high vitamin C content.

sow in rows 15 inches apart and thin to 6 or 8 inches. Laing's Garden or Purple-top are the best garden varieties. The best swedes are obtained from medium to light volcanic or silt soils; if planted in sand, a liberal amount of rotted organic manure should be dug in well below the surface. As for other root crops at this time of the year, a mulch of rotted manure will protect the crowns of swedes and turnips from sun scorch. Both of these crops should be dusted with arsenate of lead or D.D.T. as a precaution against cabbage grubs which can attack them. If affected with cabbage aphids, spraying or dusting with nicotine is recommended.

BRUSSELS SPROUTS

Like cabbages and cauliflowers, it is essential that brussels sprouts be planted in soil enriched with heavy dressings of organic manure, supplemented by side-dressings of superphosphate and sulphate of ammonia (4 : 1) and in light sandy soils, the addition of one part of sulphate of potash is desirable. This should be applied every three weeks, commencing when the plants are about 12 inches high, throughout the picking season, using a teaspoonful per plant. About a dozen plants planted in February will provide at least three pickings a week—sufficient for the average family over a season



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extending from late April until September. Except on highlands, it is not advisable to plant brussels sprouts north of the Dividing Range. Brussels sprouts do best in fairly heavy soils. In sand, they are apt to blow over unless they are supported with a small stake.

EARLY ONIONS

Onions are usually rather scarce in the spring and supplies for this period can be assured by sowing Early Flat White, White Queen or Silverskin varieties in a seed-bed during February, for planting out in April or May. By sowing rather more than is

required for planting, surplus plants can be used as "spring onions" for salads in the autumn.

WINTER SPINACH

The seed of the Winter or Prickly Spinach can be sown in succession during February and March in soil enriched as for sprouts. Spinach should also receive side dressings of sulphate of ammonia every month, dissolving it at the rate of 1 oz. to the gallon and watering it on after rain or a sprinkling. Sow in drills 12 inches apart and thin to 8 inches.

THE FLOWER GARDEN (continued from page 87).

and, under such conditions, hydrangeas thrive provided they do not lack moisture. However, where a mild winter is enjoyed, there is no need to be so fastidious in selecting a position. The extreme heat of a normal Victorian summer is damaging to the blooms and is a further reason for seeking a sheltered position. The quality of this season's blooms has no doubt been due largely to the mild summer during the peak blooming period.

The dwarf potted plants bearing one huge bloom, often seen in conservatories, and sold by seedsmen about Christmas time, are raised from tip cuttings 3 to 4 inches long taken from non-flowering shoots in December-January. These are rooted in sand in a frame, and, after about six weeks, can be transferred to 3-in. pots in which they are grown on until the spring, when they are potted on into 6-in. pots. They are then transferred from the bush-house, where they have been raised, to the conservatory for display purposes. It is quite usual to raise a fresh stock each year, but the same plants can be planted out or grown in larger pots. Incidentally, it is easier to change the colour of plants grown in pots than those in the open garden, where the root system is too extensive for easy treatment.

Hydrangeas like a moist, porous type of soil and respond well to the use of organic manures in the soil-preparation stage and later to mulching during the summer months. The quality of the blooms can be improved by the use of liquid cow manure after the flowers begin to form, used at intervals of ten or twelve days.

Much of the pruning of modern varieties is now done immediately after flowering when shoots that have flowered are cut out and the remainder allowed to mature for next year's blooms. Especially does this apply to the dwarf types. The older tall-growing types can be pruned in the winter, as usual, by thinning out the oldest shoots and shortening back the remainder to a plump bud.

The following are some worthwhile varieties for the beginner:—Altona, Apollo, Carmen, Daphne, D. B. Crane, Goliath, Heinrich Seidel, King George, Madam E. Moulliere, Miss Belgium, Venus, Parsival. Those underlined will usually respond well to "blueing". Madam E. Moulliere is one of the best of the white hydrangeas.

"PASMO" DISEASE OF FLAX

By C. R. MILLIKAN, M.Agr.Sc., Senior Plant Pathologist,
Plant Research Laboratories

Pasmo disease was identified in December, 1940, on samples of J.W.S. flax grown at Dumbalk in Victoria, from seed which had been imported from Canada. Since that date the disease has not been observed again in the field. However, in view of the serious effects of "Pasmo" disease on flax in other countries, work was initiated to obtain information on the disease under Victorian conditions.

SYMPTOMS of "Pasmo" disease may develop on flax plants at any stage of growth commencing at the cotyledonary stage and involving the leaves, stems, sepals, and ovaries (Brentzel (1926), Rost (1937), Newhook (1942)). However, in the field the disease usually becomes evident a short time before harvest, when scattered brown patches which gradually enlarge, occur in the crop. The specimens from Dumbalk were from an almost mature crop and showed conspicuous dark brown spots on the stems (Fig. 1). These spots varied considerably in size from a few millimetres upwards, and often completely encircled the stem. In very severe cases practically the whole of the stem may become affected and the plant dies.

Numerous pycnidia (Fig. 2) occur in the spots. The presence of these pycnidia serves to distinguish this disease from *Polyspora* browning, but not from the stem disease of flax caused by *Phoma* sp. (Millikan 1944).

The leaves of the plant are usually infected before the stems, the lesions at first consisting of small, more or less circular, yellowish-green—later brown spots (Fig. 3), containing numerous pycnidia. Affected leaves dry up and usually fall to the ground, although they may curl up and remain attached to the plant.

The disease may cause a serious reduction in the yield and quality of both seed and fibre.

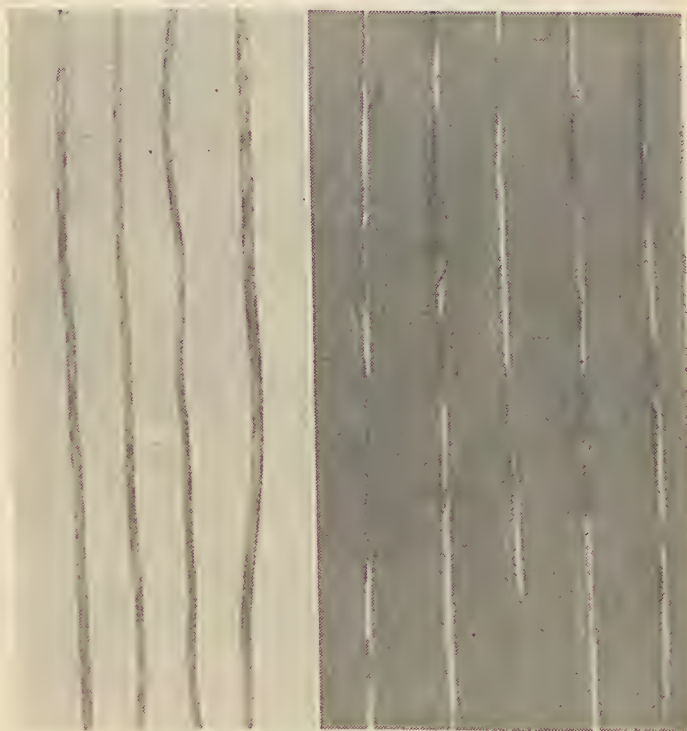


Fig. 1. Left : "Pasmo" disease of flax on specimens collected in the field. Right : The effect produced by artificial inoculation.

CAUSAL ORGANISM

Examinations of the pycnidia in lesions on affected leaves and stems (Fig. 2) showed them to be dark, submerged, lens shaped, ostiolate, 55 to 110 μ in diameter.

Ochreaceous masses of pycnosporos developed on lesions kept in moist culture, and also in pure cultures of the fungus

which were consistently isolated from lesions on stems and leaves. These pycnosporos were hyaline, elongated cylindrical straight or irregularly curved, mostly tri-septate 18.0-22.5 μ by 1.8-2.3 μ . The fungus grows readily but slowly on potato dextrose agar. The colonies are characteristically raised with very sparse aerial white mycelium, but abundant pycnidia from which pinkish colored masses of spores are exuded. The substrate usually develops a pinkish, maroon, or almost black coloration.

It was evident that the fungus concerned was *Sphaerella linorum* (Wollenweber 1938) (*Septoria linicola* (Speg.) Garassini (Garassini 1935)).

INOCULATION TESTS

To confirm the identity of the fungus, inoculation tests were made. Spore suspensions from pure cultures grown on potato dextrose agar of the isolates from the Dumbalk plants were sprayed on to Concurrent and Liral Crown plants growing in the open. Celluloid or glass cylinders capped with cellophane were placed over some of the plants for a few days after spraying to maintain the humidity, while the remainder of the plants were not covered.

Lesions typical of pasmo disease first appeared on the leaves and stems twelve days after spraying (Fig. 3). Although they were most numerous on the plants in the cylinders they also occurred on the sprayed plants growing in the open. Stem lesions usually first appeared at

the base of the plant, rapidly coalesced and finally resulted in the death of the plants. Numerous pycnidia occurred in the lesions (Fig. 2) from which the fungus was re-isolated in pure culture. It was evident from these tests that the fungus was very pathogenic to flax and was the causal organism of "Pasmo" disease.

VARIETAL RESISTANCE STUDIES

It has been found that flax varieties vary considerably in their resistance to "Pasmo" disease. Bolley's Golden, Buda and Bison are reported to be resistant to the disease (Rodenhiser (1930), Bolley (1931), Godfrey and Rich (1939), Flor (1943)), whereas Argentine varieties and hybrids appear to be particularly susceptible (Brentzel (1926, 1930), Garassini (1935), (Dillman and Stoa (1942))).

Rodenhiser (1930) has described several physiological forms of *Phlyctaena linicola* (*Sphaerella linorum*) which could be distinguished by their growth on artificial media. However, pathogenicity tests of 4 such culturally distinct forms gave no differences in the greenhouse, although in the field differences in the degree of infection resulted from inoculation with two lines of the fungus.

In Victoria during 1944 and 1945, experiments have been conducted to study the reactions of flax varieties to *Sphaerella linorum*.

Method

Single rows 25 links long and 1 link apart of each variety were sown in the

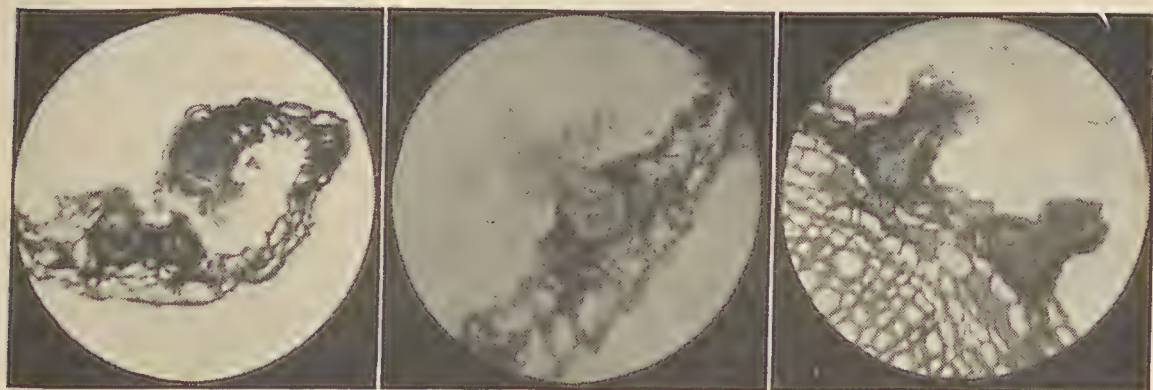


Fig. 2. Sections through "pasmo" lesions produced by artificial inoculation on flax leaves (left and centre) and stem (right) showing pycnidia and spores of *Sphaerella linorum*.

experimental field at Burnley. From the time the plants were a few weeks old, until shortly before harvest, they were sprayed at fortnightly intervals with spore suspensions of *S. linorum*. Some plants of each of the varieties were enclosed in long glass cylinders or large lamp glasses and then sprayed with the spore suspension after which the tops of the cylinders were covered with cellophane for approximately 1 week to maintain a high humidity inside.

Results

It was found that lesions of "Pasma" disease could be readily produced on the sprayed plants enclosed in cylinders to maintain the humidity. These lesions consistently first appeared approximately 12 days after spraying.

On the other hand attempts to produce the disease in plants in the open were largely unsuccessful until shortly before the plants were mature, when some spread of the disease occurred. This failure to produce the disease in the open was due to the prevailing weather conditions. During the 1944 season, severe drought conditions and much wind were experienced, with the result that the average relative humidity was low and therefore unfavourable to the development of "Pasma" infection.

The varietal reactions set out below are therefore based largely on the results obtained from the spraying of the enclosed plants. It is possible that the results of further tests under conditions more conducive to the development of the disease in the open, may cause some modifications in the classification set out below which is based principally on the severity of stem lesions. Several different strains of certain of the varieties were included, and in some instances different reactions were recorded.

VERY SEVERE LESIONS.—Beladi, Blue Riga, Cawnpore 483, Cawnpore 1150, Cawnpore 1193, Cawnpore 1206, EB3, Giza, Hindi, I.F. 82 G.38/7, Indian,



Fig. 3. Showing stages in the development of "Pasma" disease in leaves of flax. These results were produced by artificial inoculation.

Indian (white seeded), J. Lord, *Linum crepitans*, *Linum crepitans* (Spain), O.S.X., Punjab (3 strains), Recolte No. 0189, Recolte No. 0196, Rio, T5, T8, Tammes, Tammes Blue 1, Uruguay G.36/48.

SEVERE LESIONS.—Abyssinian, Argentine (large seeded), A48 G37/4, Bolley's Golden, Bolley's Golden Seln., Chapman, Concurrent, Diadem, Dutch (Giganta) I.M. 39/3014, F55, Ford, Giza Oil, Giza Purple, Herculeslin, Hollandischer Faserflacks, J.W.S., J.W.S. x Bison, Jogeva 76, Koto, L4 Crown, L9 Dominion, *Linum usitatissimum*, Liral 6, Martin, Minnesota 11-29-1, Monarch, Ottawa 770B, Punjab (2 strains), Riga Crown, Rigaer Leinsart, Rota, Russian, Stormont Gossamer Superior, Tammes, Tammes Crimped White, Tammes Light Blue, Tammes Lilac, Uruguay G36/49, Uruguay 36/52, Viking, Viking (Heggeness), Walsh.

MODERATE LESIONS.—Akmolinsk, Argentine, Biwing, Blenda, Dutch (giganta) 4 G40/65, Hercules, I.F. 808 G38/11, J.H.C., J.W.S., Jogeva 108, Kenya, L2 Prince, L11 (Sussex), Lin Ameliore, Lin de Tunisie, Liral 2, Liral Crown (Egypt), Liral Dominion, Liral Prince, Malabrigo, Minnesota 11-30-52, Newland, Newland x (19 x 112), Ottawa 770 BX Buda, Ottawa 829c, Redson, Rio, Russian x Argentine, Seln. I.F. 22450/30, Stormont

[continued on page 96.]



JAM MAKING IN THE HOME

By RUTH BROMFIELD

THERE are many factors which go to make jam quality. A really good jam must keep well, should be clear and bright in colour; well set, though not too stiff, and should have a distinct fruity flavour.

The first consideration is the fruit, which should be as fresh as possible, and if anything, slightly under-ripe. Over-ripe fruit rarely makes a satisfactory jam, as it usually fails to set properly. The reason why fruit is capable of forming a "gel" or jelly when boiled with sugar is that it contains in its cell walls a gum-like product called *pectin*. The first object is to extract the pectin from the fruit, and this may be done most easily when the fruit is slightly under-ripe. The presence of *acid* is also important, as it helps to extract the pectin, and also is essential to a good set, brightens the colour of the jam, improves the flavour, and helps to prevent crystallization of the sugar.

The amount of pectin and acid varies in different fruits, and is also affected by the degree of ripeness of the fruit. A further important point is that the fruit should be as dry as possible: one pound of dry fruit is proportionately richer both in pectin and in acid than one pound of wet fruit, in which water accounts for some of the weight.

Another ingredient essential in jam making is the *sugar*. This plays an important part

in the set of the jam, and its concentration in the finished jam must be such that neither fermentation nor crystallization will occur easily.

Finally, care must be taken in covering and storing, otherwise the jam may develop a mould during storage.

STEPS IN JAM MAKING

As previously mentioned, the fruit should be fresh and slightly under-ripe. Cooking apples, red and black currants, damsons, green gooseberries, and some plums are easy to convert into jam, because they are rich in both pectin and acid. Fruits of medium setting quality include apricots, blackberries, greengages, loganberries, and raspberries. Fruits of poor setting quality include cherries, pears, and strawberries.



Suitable jam-making equipment.

Preparation of Fruit

Stems, leaves, or diseased portions should be removed and the fruit rinsed in cold water. The fruit is then left whole or cut as desired. The fruit should be cooked gently for some time before the sugar is added. The object of such cooking is to soften the skin and break down the cell walls of the fruit and so extract the pectin. Sufficient water should be added to prevent the fruit from burning, but the amount needed will depend on the juiciness of the fruit in the pan. The riper the fruit, the less water will be required for softening and cooking. Fruit should be brought to the boil, and then allowed to simmer gently until reduced to a pulp.

Black currants and plums should be cooked for $\frac{1}{2}$ to $\frac{3}{4}$ hour or until the fruit is broken down and the skins are thoroughly soft. All fruits which require added water should be boiled down by about one-third before the sugar is added. Fruits which break down readily, raspberries and strawberries for example, do not require the addition of any water and need simmering for 10 to 15 minutes only, before the sugar is added. To prevent the pulp from sticking to the pan and to avoid scum, rub the bottom of the pan with a small piece of butter.

Addition of Acid

The acid should be added before the fruit is cooked as it helps to extract the pectin. When the fruit is slightly over-ripe or stale, and is thought unlikely to jell, the following substances may be used to provide additional

acid. The quantities suggested are suitable for adding to 4 lb. of fruit.

Lemon juice—2 tablespoons juice (approximately 1 average lemon).

Citric or Tartaric Acids—1 small level teaspoon of either.

Fruits Rich in Pectin

Cooking apples, red and black currants, green gooseberries, green quinces, bitter citrus fruit, and most plums are rich in pectin if picked at the slightly immature stage, and used in the fresh state.

Fruits Deficient in Pectin

Melon, apricot, peaches, strawberries, figs, sweet cherries and sweet oranges are deficient in pectin. These fruits require the addition of fruit or lemon juice, rich in acid or pectin, to set firmly.

To Test for Pectin

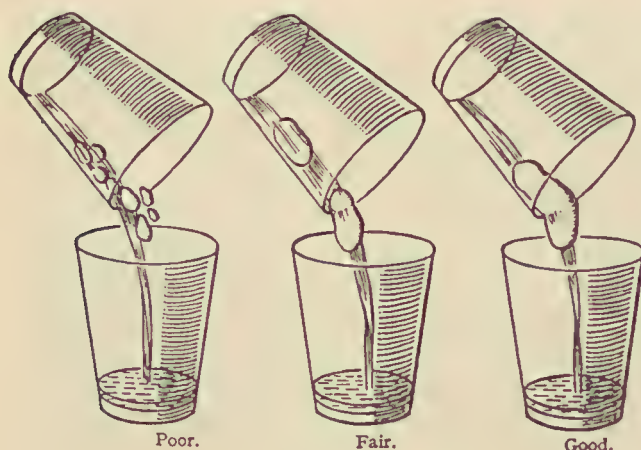
Those experienced in jam making soon learn the fruits which can be relied upon to provide sufficient pectin to make a well set jam. However when some doubt is felt as to the setting qualities of a particular fruit, the following test will prove useful.

When the fruit has simmered until the skins are softened, take a teaspoonful of juice in a cup and allow to cool. When cold, add 3 teaspoons of methylated spirits; shake gently together and leave for 1 minute. If there is plenty of pectin in the fruit, a transparent jelly-like lump is formed. If the pectin content is moderate, the clot of jelly is not very firm and may be broken into two or three lumps. If little pectin is present, the clot will break into numerous pieces.

The general rule is that the more pectin there is in fruit, the more sugar it will set. For instance, if a good clot is obtained, $1\frac{1}{4}$ lb. can be added to each pound of fruit. If the clot is fair, 1 lb. of sugar could be added to each pound of fruit. If the clot is poor, it is doubtful if the jam will set, unless some extra pectin is added.

Pectin may be added as follows:—

(a) *Blending of Fruit Rich in Pectin.*—Blackberry and apple, cherry plum and ripe gooseberry, are examples of mixed fruit in which the pectin, that may be lacking in one fruit, is supplemented by that in the other.



Pectin clots

(b) *Adding Fruit Juice Rich in Pectin.*—Most fruits deficient in pectin also lack sufficient acid, so that the addition of fruit juice rich in both of these constituents will have a beneficial effect in both ways. Lemon juice is rich in pectin and is also very acid.

(c) *Adding Commercial Pectins.*—The use of such pectins is quite unnecessary when making jam from black currants, gooseberries, &c. (fruits rich in pectin), but when difficulty is obtained with fruits such as strawberries, cherries, and rhubarb, the addition of pectin can be of great use and give excellent results, provided the added quantity of pectin is accurately measured. The flavour of the jam can be ruined by the addition to too much pectin. The makers of pectin supply recipes and full instructions as to the exact method to be employed.

Sugar

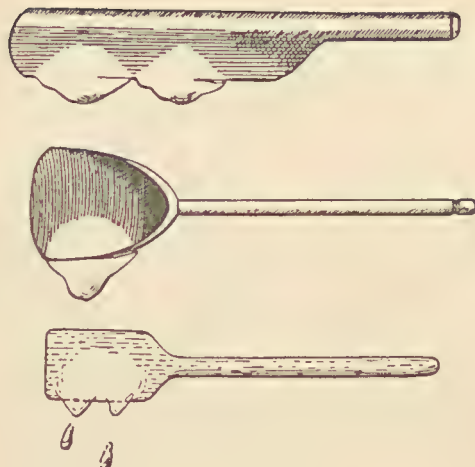
Sugar plays an important part in jam making because the jam owes its keeping qualities to it. A poor set will result if there is too much or too little sugar present. When the sugar is added, the jam should be stirred until all the sugar is dissolved, and then the jam should be brought to boiling point as quickly as possible, and allowed to boil rapidly. Sugar has a hardening effect on fruits, so that if the sugar is added to thick-skinned fruits, such as black currants, before the skins are thoroughly soft, the skins will be toughened at once, and the trouble cannot be rectified. Conversely, soft fruits such as strawberries, if required to remain whole, are covered with sugar overnight.

BOILING WITH SUGAR

If the fruit has been well-cooked before the addition of sugar, it should not afterwards be necessary to boil the jam for longer than 5 to 30 minutes according to its kind and quantity. *Slow cooking before the addition of sugar and rapid and short cooking afterwards is the golden rule for jam making.* If the sugar is added too soon, so that the fruit and sugar are boiled too long together, both the colour and the flavour of the jam are spoilt and the probability of having tough skins in the jam is increased. It is a mistake to make too much jam at once.

Testing the Setting Point

THE FLAKE TEST.—A wooden spoon is dipped into the jam, removed and turned



The flake test.

horizontally in the hand until the adhering jam is slightly cooled. The jam is then allowed to drop from the edge, and if it has been boiled sufficiently so that the jam has partly set on the spoon the drops will run together forming flakes which break off in a clean, sharp manner.

TEMPERATURE TEST.—A thermometer may be used. If the jam is boiled to 222° F. the sugar percentage will usually be right, and if the fruit contains plenty of pectin and acid, the jam will set. The jam should be stirred thoroughly before the temperature is taken. This test should be used in conjunction with the "flake test".

COLD PLATE TEST.—When a little of the jam is cooled on a plate, the surface should set and crinkle when pushed with a spoon. The drawback to this method is that the bulk of the jam is allowed to go on boiling while the small quantity is cooling on the plate, and consequently the setting point is often passed.

Finishing of Jam

When the jam has reached setting point, it should be removed from the fire, and the scum taken off quickly with a clean spoon. The jam should then be poured into clean, dry, warm jars, which are standing on a wooden or cloth-covered surface. To allow for the considerable shrinkage that takes place during cooling, the jars should be filled right to the top with hot jam. With strawberry jam, or other jams containing whole fruit, the jam should be allowed to cool in the pan until a thin skin begins to form, when the

jam should be stirred gently and poured into the jars. The liquid thus thickens a little, and when it is poured into the jars the fruit remains suspended instead of floating to the top. The above precaution applies equally to marmalade.

After filling, the jars may be sealed immediately or when quite cold, with melted paraffin wax or cellophane circles. Jam should be stored in a dark, airy cupboard at ordinary room temperatures. Excessive heat or dampness encourages mould growth.

Faults and Remedies in Jam Making

MOULD requires dampness for growth. This is likely to result from using jars that were not thoroughly dry, using mushy fruit, the insufficient evaporation of water during cooking, and storing under damp conditions. When jam shows a mould it is perfectly safe

to remove the mould and use immediately or reboil for five minutes, and re-bottle in clean, dry, jars.

CRYSTALLIZATION may be due to over-concentration of sugar caused by over boiling, insufficient acid, or by failure to dissolve sugar before boiling. Sometimes this may be remedied by re-boiling with the addition of a small amount of water and lemon juice.

FERMENTATION.—Evidence of fermentation is given by the presence of small frothy bubbles in the jar and a tart taste. This may be caused by insufficient sugar, or by not boiling the jam for a sufficient length of time. The jam may be re-boiled with the addition of a little sugar.

SYRUPY JAM may be due to over-boiling with sugar, to a deficiency of acid or to a too high proportion of sugar.

"PASMO" DISEASE OF FLAX (continued from page 92).

Cirrus, Superior 54, Tammes, Tammes Blue Yellow Anthers, Tammes Flat White, Triumph, Walsh, Very Pale Blue Crimped, Victorian Commercial, Z.P.C.

LIGHT LESIONS.—Bison x 479, Buda, Canadian Blue, Certified White Dutch, Hercules, *Linum crepitans* (Ukraine), Liral Crown, Liral Duke, Liral Prince, Martin, New Zealand, Smoky Golden, Stormont Cirrus, Var. 8063.

VERY LIGHT LESIONS.—Bison, J.W.S. x Bison, Novelty, Russian.

In general, linseed varieties from Egypt and India appeared to be particularly susceptible to "pasma" disease. The variety Bison proved to be resistant in these tests, which result is in accord with the experience of American investigators cited above. However, severe lesions were produced on the stems of the plants of Bolley's Golden.

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The following account of cereal experimental work conducted at Dookie Agricultural College and other Northern District centres, was prepared by Mr. H. C. H. Watson, B.Agr.Sc., Dip.Agr. (Dookie), Field Officer. This article has been included in a guide book which is now available for general distribution and for the information of visitors to the College.

DOOKIE Agricultural College is situated in the eastern sector of the main Victorian wheat belt and also is in the centre of a very extensive sheep-raising area. The average annual rainfall is 21 inches.

Wheat improvement work has been undertaken at the College for more than 50 years. The breeding and development of wheat varieties was commenced in the eighties by Mr. Hugh Pye, who continued this work until his retirement in 1931. Throughout his long career as a wheat breeder, Mr. Pye produced many valuable varieties and achieved notable success with such wheats as Warden, Currawa, Major, Glueclub, Baldmin, and others.

Since 1933, the Department of Agriculture has conducted the cereal research work at the College, and considerable extensions were made in the years prior to the war. The work is now being resumed on a fairly large scale, including long-term soil fertility investigations in addition to the comprehensive plant-breeding programme.

The experiments are undertaken to furnish information on various factors associated with wheat growing, and the evidence from the tests has a wide application throughout the Northern District, which is one of the principal wheat-producing areas of the State. The soils throughout this district vary in texture and fertility—they are mostly red in colour and range from stiff clays to friable loams. There are also one or two relatively small pockets of very fertile "black" land. The rainfall varies from 15 to 25 inches per annum, the bulk of the wheat being grown in the 16 to 21-inch division.

In the experimental fields at Dookie College the soils are mostly red loams of moderately good fertility. The main trials are carried out under modern methods of field experimentation, and are located in three paddocks cropped under the rotation, fallow-wheat-oats and peas (cut for hay or silage). The area devoted each year to the cereal plots amounts to some 50 acres. During the war years the scope of the

experimental work was of necessity considerably curtailed, but it was possible to maintain some of the more important permanent trials. New experiments on pasture improvement, and the maintenance of soil fertility with clover-leys farming have been commenced, and the results from these sections should prove of general interest, as sheep raising, in conjunction with cereal growing, is widely practised in the district. Trials were initiated last year to investigate the comparative suitability of various British-breed rams as fat-lamb sires when mated with half-bred ewes.

In addition to the work at Dookie College, cereal experiments are conducted by the Department of Agriculture at other centres in the Northern Districts, namely, at the Rutherglen Research Station, and, on a smaller scale, on farmers' properties at Invergordon (Mr. M. White), and at Diggara (Messrs. J. T. Haines and Sons), in the Elmore-Rochester area, to the west. In past years, tests were also carried out at Shepparton and Waaia.

SUMMARY OF EXPERIMENTAL WORK

The experimental work conducted at Dookie College since 1933 has included the following investigations:—

(a) Variety Trials—Wheat, Oats, Barley, &c.—

(a) ON FALLOW LAND.

- (1) Wheat—Senior Yield Trial, with the most prominent varieties and crossbreds;
- (2) Wheat—Junior Yield Trial, with promising crossbreds, selections, and varieties introduced from other States;
- (3) Hay variety tests;
- (4) Observation plots—wheat and oats;
- (5) Barley yield trial;
- (6) Flax trial—varieties tested primarily for linseed production;
- (7) Pea trials—observations and yield trials of crossbreds and selections;

(b) ON STUBBLE LAND.

- (8) Variety trials with oats and wheat—hay and grain;
- (9) Pea trial—varieties of field peas.

(b) Cereal Breeding and Seed Production—

- (1) Stud row section—Single rows of wheat, oats, and barley;
- (2) Seed production—Plots for multiplication of seed.

(c) Manurial Trials—Wheat and Oats—

- (1) Wheat manurial test (on fallow)—effect of superphosphate and other fertilizers;
- (2) Oat manurial trial (on stubble land)—with superphosphate and “super. and ammonia” mixtures;
- (3) Mineral deficiency trials—
 - (a) With minor elements (copper, zinc, manganese, &c.) on wheat and oats;
 - (b) Effect of zinc sulphate on strong, black land—this trial, with wheat, was conducted on the farm of Mr. C. Bennett at Dookie.

(d) Rate and Time of Seeding Trials—Wheat—

Three varieties each sown at three rates of seeding at two sowing periods, normal and late.

(e) Grazing Trials—Wheat and Oats—

- (1) With oats on stubble land—to determine the comparative amounts of grazing provided by different oat varieties and their recovery capacity after grazing.
- (2) With wheat on fallow—to measure the effect on the yield of grazing the crop with sheep in winter.

(f) Disease Investigations—Wheat and Oats—

- (1) To test the effect of dry pickling compounds on the yield of wheat;
- (2) To compare the efficacy of various pickling powders in the control of ball smut of wheat and smut diseases of oats;
- (3) To study the effect of various treatments on the incidence of loose smut of wheat;
- (4) To compare the relative susceptibility of wheat varieties to rust.

(g) Cultivation Trials—Wheat—

- (1) Tests on depth of sowing, effect of deep discing of the seed-bed, and harrowing after sowing;

(2) *Phalaris* : cultivation trial—to investigate the effects of various cultivation treatments and subsequent cropping on a *Phalaris* sward.

(h) Crop Growth Investigations—

To furnish data on the influence of seasonal conditions on wheat plant development.

(i) Crop Rotation and Soil Fertility Section—

(1) Permanent rotation tests—

To compare six cropping systems—wheat grown in various rotations with oats, peas, pasture, &c.

(2) Establishment of pastures on cereal stubbles :—

Tests on the establishment of pasture plants on regularly-cropped cereal land reverting to short-term pasture—various species sown with and without a cereal cover crop;

(3) Soil fertility trials :—

(a) To measure rate of regeneration of intensively-cropped land when spelled under clover pasture for varying periods;

(b) To measure rate of deterioration of soil fertility of clover-ley when intensively cropped;

(c) To determine optimum time of cultivation of clover-ley land.

DESIGN OF CEREAL EXPERIMENTS

In order that different soil conditions should not affect the comparison between plots, it has been found advisable to repeat or replicate each plot in a trial, rather than to use the older "single plot" method of testing. In the system adopted, which is known as the "Randomized Block System", plots are smaller than were used for single-plot testing, and each variety or treatment is sown once in a block of plots, and each block is repeated, usually four times. This system enables more accurate comparisons to be made between varieties or treatments, and the results to be examined statistically for significance. All cereal experimental results referred to in this report are those from replicated plots.

The Randomized Block System is designed primarily to test only one variable, i.e., different varieties, or different manurial treatments. However, much of the information required involves the consideration of more than one factor—e.g., does the rate of seeding or the time of sowing affect the manurial requirement of the plant?

Therefore, some trials have been sown on a design that enables such comparisons to be made. This modification is known as "Factorial Design".

The yields per acre quoted in this report are those actually harvested from the plots. Such yields are considerably higher (up to 20 per cent.) than would be the case if it were not necessary to have paths between the plots. Much sampling of plots has been done to ascertain if there has been a



A section of the wheat experimental plots.

differential response by varieties or rate of seeding to this pathway effect, but no indication of any such effect has been found, and overseas literature shows the same result. However, when studying the figures, due allowance should be made for this pathway effect.

SEASONAL CONDITIONS AT DOOKIE, 1947

The first half of 1947 was an anxious period for Northern District farmers. Rainfall during January and February was below normal, but good falls were recorded during March, which enabled stubble and fallow land to be worked and gave pastures a start. Then followed three months of exceptionally dry and mild weather, with the rainfall much below average and occurring mostly as scattered light showers. Many farmers sowed oats and wheat in comparatively dry soil and germination was in many cases either delayed or very uneven. The absence of normal seeding rains was also reflected in the tardy growth of pastures throughout the northern country, and, in many areas, handfeeding of stock was necessary.

Opportune rains received at the end of June and throughout July enabled seeding to be completed, revived the earlier-sown crops, and greatly improved the condition of pastures.

RAINFALL RECORDS—DOOKIE COLLEGE.

	1944.	1945.	1946.	1947.	Average 66 years.
January ..	7	227	229	33	131
February ..	27	13	439	126	123
March ..	42	3	139	305	145
April ..	168	23	88	33	172
May ..	333	75	104	48	205
June ..	57	285	161	147	257
July ..	133	185	292	373	205
August ..	..	319	152	199	223
September ..	46	131	37	263	186
October ..	100	251	148	322	201
November ..	77	188	245	102	136
December ..	211	39	86	327	118
Total points	1,201	1,739	2,120	2,278	2,102

Spring rains were above average and weeds were more prevalent than usual, while rust developed in a number of crops resulting in reduced yields and some poor grain samples. Some of the taller wheat varieties lodged, but district crops generally gave fairly satisfactory yields. Pasture growth was good throughout the spring and did not dry off until late in the year.

CEREAL BREEDING—WHEAT VARIETY TESTS

The practice of the Department is to carry out the crossing and first generation stages of cereal breeding work at the State Research Farm, Werribee.

The second generation crossbreds are then sown in stud rows at the various experimental stations throughout the State, where selections



Wheat variety trial plots at Dookie.

of the most promising strains are made and seed supplies developed. Only those plants exhibiting desirable characters are considered for further testing and selection, and, after a number of years, only a few of the more promising true-breeding strains of the original population are retained.

New crossbreds which have shown promise in the stud rows are transferred to the *Junior Yield Trial* for their first accurate yield test in replicated plots.

After an extended period in the junior plots the best varieties are then promoted to the larger *Senior Yield Trial* for further testing over a number of years against standard varieties and more advanced crossbreds.

The varieties under test are reviewed each season, and new wheats are included from time to time to replace those discarded on account of their lower yielding ability or other inferior characters. Special attention is paid to varieties possessing superior flour quality, and each year comprehensive milling and baking tests are carried out by the Departmental cereal chemists on all varieties in these sections.

In the Senior Yield Trial fifteen wheats are under replicated test this season, namely, Quadrat, Magnet, Pindar, Pinnacle, Ghurka, Baldmin, Bencubbin, Raneo 4H, Insignia, Diadem, Regalia, Javelin,

Ghurka×Amity, Ghurka×Pusa 4, Ghurka×O.M.G. The plots were sown with 65 lb. of seed and 1½ cwt. of superphosphate per acre.



Typical heads of the new wheat, Diadem.

TABLE 1.—WHEAT VARIETY TRIALS IN THE NORTHERN DISTRICTS.

Average Yields in Bushels Per Acre.

Variety.	Dookie College.			Diggera.		Inver-gordon.	Rutherglen Research Station.	
	10 Years, 1937-46.	7 Years, 1940-46.	4 Years, 1943-46.	5 Years, 1941, 1943-46.	3 Years, 1944-46.	3 Years, 1940, 1941, 1946.	6 Years, 1938, 1940-42, 1945-46.	3 Years, 1942, 1945-46.
Magnet	34.1	34.5	28.0	19.3	19.3	28.5	30.5	30.9
Quadrat	33.3	33.3	27.7	19.9	19.6	28.2	30.6	32.0
Pindar	..	32.9	26.4	..	..	26.3	30.7	32.2
Diadem	..	32.5	26.4	18.4	18.1	..	..	32.2
Bencubbin	31.7	32.1	27.4	19.1	18.7	26.0	..	28.9
Baldmin	32.3	31.4	25.0	17.7	18.8	25.8	31.0	31.5
Ghurka	30.6	31.0	26.0	16.1	15.5	26.0	29.6	31.4
Regalia	..	30.7	25.8	18.2	18.7	25.6	29.6	30.4
Raneo 4H	29.3	29.9	24.3	18.0	17.9	24.2	..	..
Insignia	..	..	28.0	..	22.0	..	..	..
Pinnacle	..	..	26.1	..	15.0	..	..	28.7
Ghurka x Amity	..	..	28.9	..	..	..	..	..
Ghurka x Pusa 4	..	..	25.2	..	17.1	..	..	..

NOTE.—The yields per acre quoted in this report are those actually harvested from the plots. Such yields are considerably higher (up to 20 per cent.) than would be the case if there were no paths between the plots.

The average yields obtained in past years in the departmental tests at Dookie College, together with the results at other centres in the Northern Districts, are set out in Table 1.

PROMINENT WHEATS IN THE NORTHERN DISTRICT TESTS

Quadrat—

The most extensively-grown variety in Victoria, having displaced Ghurka in popularity in recent years. It has consistently outyielded Ghurka in all Northern District tests, and has also proved to be very prolific in the Wimmera. Developed from a cross between Ghurka and C.M.G., this comparatively new variety is a free-stripping, brown-chaffed wheat with a short, strong straw. Quadrat is a mid-season variety producing grain of good colour, and which does not crack readily. It is highly resistant to flag-smut.

Magnet—

A late-maturing, white-chaffed variety with a strong straw of medium height suitable for grain and hay. It has good harvesting features, but is rather tougher than Quadrat and Ghurka. Although susceptible to rust and flag-smut, this wheat has given high yields at Dookie and also in the Wimmera. Because of its late maturity, it responds strongly to late rains, although the heads are often "tipped" by hot winds.

Pindar—

A selection from Ghurka, is a distinct improvement on that variety in both prolificacy and flour quality, and its grain is larger and more attractive. It is similar to Ghurka in disease resistance and field characteristics, except that it is slightly taller and a little earlier in maturity.

Diadem—

A recently-named variety produced by the Department of Agriculture with the objective of combining the high quality of the Canadian wheat, White Fife, with the prolificacy of Ghurka. It is a mid-season white-chaffed wheat of medium-strong flour quality, and has yielded well in tests at Dookie, Longerenong College, and Rutherglen Research Station. It is at present being multiplied by selected growers for wider distribution to neighbouring farmers.

Ghurka—

For more than ten years, Ghurka was the most popular Victorian variety, and is still widely grown on account of its adaptability to varying conditions. In recent years, a number of newer varieties have proved more prolific in yield, and some produce flour of better baking quality. These varieties have been bred for specific districts, and most of them have Ghurka as a parent.

Baldmin—

A medium-strong wheat which was bred at Dookie College, was an outstanding yielder in the College tests for many years, but newer wheats have proved more prolific, and a tendency for its straw to break during harvesting has limited its popularity.

Pinnacle—

A further selection from Pindar which it resembles very closely in general characteristics. The production of this variety marks a distinct advance in the objective of improving, not only the yield, but also the grain and flour quality of Victorian wheat. Pinnacle has not given such good returns in the Northern Districts as it has in the Wimmera.

Bencubbin—

An early mid-season, white-chaffed variety with medium to tall straw rather liable to lodge. It is a popular wheat in Mallee districts, and has given good yields at Dookie and Diggara.

Ranee 4H—

A standard wheat in the Northern Districts for many years on account of its hardiness and early maturing. It is, however, susceptible to both flag-smut and rust, and is now being replaced by other recommended varieties.

Insignia—

A variety which, it is expected, will be widely sown in the Mallee during the next few years. It is the result of a cross between Ghurka and Ranee, and was named in 1946. It is an early wheat, maturing a few days before Ranee 4H. Insignia has a short strong straw slightly taller than Ghurka, and it stands better than most early types. Like Ghurka, it is resistant to flag-smut, and is less

susceptible to rust than Rancee 4H. It produces a semi-compact, brown-chaffed head with short awns, and has proved easy to thresh at harvest without showing any tendency for the grain to crack. Insignia normally produces a medium-sized grain, with flour at least equivalent in baking quality to its Rancee parent, and superior to Ghurka and Quadrat. The evidence obtained to date with respect to its yielding ability in the Mallee proves it to be an outstanding variety. At Dookie, Insignia has been a leading variety over the past four years, and at Diggara, where the rainfall is much lower, its average yield for three years has been 2·4 bushels per acre higher than all other varieties tested.

Regalia—

An early-maturing wheat resembling Rancee 4H in most characters, but in the drier areas it is likely to be supplanted by Insignia when more seed is available.

VARIETIES RECOMMENDED FOR NORTHERN DISTRICTS

Each year, The Victorian Wheat Advisory Committee, consisting of representatives of wheatgrowers, millers, bakers, and the Department of Agriculture, after consideration of the yield performances, quality characteristics, disease resistance, and field characteristics of the various varieties, issues a table of recommended varieties for each district.

In view of the wide range of soil and climatic conditions in the statistical Northern District, the Wheat Advisory Committee considered it desirable, from the point of view of variety recommendations, to divide that district into two sections, and group the eastern portion with the North-Eastern District. Two zones are thus formed, viz.:—Mid-Northern and East-Northern, with the Shepparton-Tocumwal railway as the approximate dividing line.

The current recommendations for the Northern Districts are:—

MID-NORTHERN DISTRICT (west of Shepparton railway line).

Quadrat, Pindar, Ghurka, Rancee 4H, Bencubbin, Insignia.

The normal rainfall in the Northern District increases sharply from the north-west to the south-east. In the drier parts,

the early varieties such as Rancee 4H and Bencubbin are strongly recommended, and Insignia is also recommended for trial. Elsewhere, the later types Quadrat, Pindar, and Ghurka, are all recommended as standard wheats, and Magnet will yield well with late rains.

EAST NORTHERN DISTRICT (east of Shepparton railway line).

Quadrat, Magnet, Pindar, Pinnacle, Ghurka, Baldmin, Bencubbin, Rancee 4H, and Insignia.

Whereas Ghurka was previously the main wheat in this east-northern area, it is now being replaced by Pindar, Quadrat, and Magnet. Pinnacle is also being tried and should prove superior to Ghurka. Baldmin, a mid-season type, has proved to be very prolific in the Dookie-Shepparton section, its superior flour being an additional attribute. Where earlier varieties are required, Bencubbin and Rancee 4H appear to be the best available, and Insignia is worthy of trial.

WHEATS GROWN IN THE NORTHERN DISTRICT

The varieties sown in the Northern District have changed considerably during the past fifteen years. Free Gallipoli, the most widely-grown variety in 1930, reached its peak of popularity in 1933, occupying 57 per cent. of the wheat acreage of the



Heads of the popular variety, Quadrat.

district in that season. Since then, the area sown to this variety has rapidly declined, and it has now practically gone out of cultivation.

Ghurka, sown on a relatively small area in 1933, became the principal variety two years later, and was the chief wheat grown in the district, occupying 45 per cent. of the acreage as recently as 1941.

Since then, it has declined to 15 per cent., having been replaced by the newer wheats, Quadrat (37 per cent.), and Magnet (20 per cent.).

Further changes can be anticipated as more improved varieties become available to district wheat growers.

The second portion of this article dealing with oat and wheat grazing trials, oat and wheat manurial trials, mineral deficiency trials on wheat and oats, etc., will appear in a subsequent issue of the Journal.

SEED WHEAT PRODUCTION AT DOOKIE

The seed-production section is an important feature of the work on the cereal plots. Each year a number of wheat variety plots is sown with specially-selected seed, which is kept pure and true to type. By this means a continuous supply of "fresh" seed of the most improved strain available is maintained. The produce from these plots is used to sow the College farm paddocks. In their turn, these paddocks provide the seed wheat which is distributed in large quantities to farmers throughout the State.

Green Manuring in the Orchard

A winter green-manure crop in the orchard confers numerous benefits, chief of which are:—the growing crop removes surplus water from the soil; conserves plant foods and holds the soil against erosion. After the crop is ploughed in, plant-foods, mainly nitrogen, but smaller quantities of calcium, potash, iron, magnesium, and zinc are released during the decomposition of the crop and slowly become available to the trees or vines. The decomposing organic matter has a beneficial effect on soil structure, and improves the penetration of rain or irrigation water.

Green crop failures are usually due to late sowing. In some seasons when the weather during the autumn is dry, this is unavoidable, but in a normal year, the most successful crops are those sown in February or March.

The recent rains in Victorian orchard districts have left most soils in excellent

condition for immediate sowing. Where the crop is yet to be picked alternate lands may be sown to the green crop leaving vacant lands for carting out the fruit.

At present there is, unfortunately, a shortage of some of the usual kinds of seed for green-manuring, such as lupins and tick beans. Leguminous crops are the most valuable because of the higher nitrogen content of green material, and there appear to be ample supplies of dun peas available. After the land is ploughed the peas may be broadcast or drilled in at the rate of $1\frac{1}{2}$ bushels per acre, together with 2 cwt. per acre of superphosphate. On acid soils, liming (2 tons per acre of ground limestone) will considerably improve growth.

Finally, for best results, remember that early sowing is essential.

[Contributed by the Horticultural Division.]

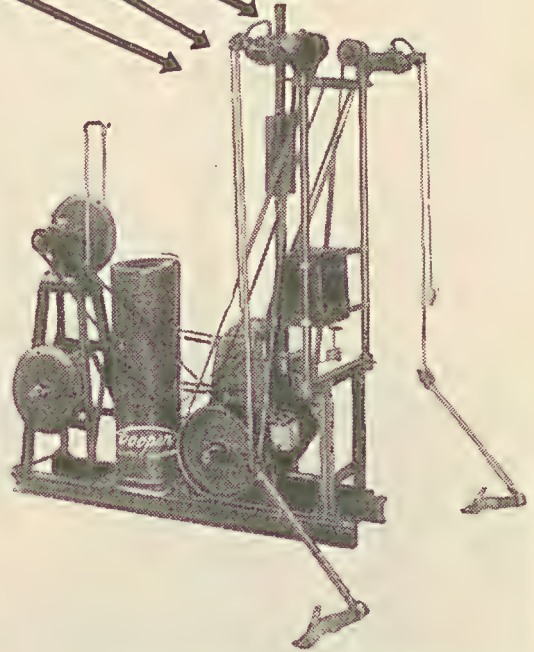
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LIVE STOCK NOTES

Compiled by A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

MEAT PRODUCTION

MEAT production in Victoria during 1947 was 225,000 tons, or 11,000 tons less than in the previous year. This was due largely to the slaughtering of 750,000 fewer sheep, which is an indication that breeding flocks are still being increased.

Bullock slaughterings were down by 6,000 head, but increased numbers of other stock were slaughtered. For instance, 17,000 more cows, 4,000 more young cattle, 35,000 more calves, 150,000 more lambs, and 30,000 more pigs were slaughtered. The increased slaughtering of cows, young cattle and calves is an indication of a further reduction in dairy farming.

Comparative slaughterings for each of the half-yearly periods of the past two years were as follows:—

—	January to June, 1946.	July to December, 1946.	January to June, 1947.	July to December, 1947.
Sheep ..	1,506,000	1,748,000	1,238,000	1,291,000
Lambs	979,000	2,403,000	1,016,000	1,525,000
Bullocks	71,000	87,000	68,000	82,000
Cows ..	91,000	101,000	108,000	101,000
Young Cattle	22,000	22,000	24,000	24,000
Calves ..	72,000	170,000	96,000	181,000
Pigs ..	171,000	164,000	186,000	179,000

Although 1947 was a good year, with ample feed supplies, the average carcass weights were not up to the previous year's high figures. Sheep carcasses averaged about 44 lb. as against 45 lb. in 1946, lambs 36 lb (40 lb. in 1946), bullocks 625 lb. (660 lb.), cows 405 lb. (415 lb.), and young cattle 250 lb. (250 lb.). Calf carcasses were about 3 lb. lighter at 61 lb., while pigs averaged about 161.5 lb. dressed weight.

The average production of meat over the past four years is set out in the following table:—

—	1944.	1945.	1946.	1947.
	tons.	tons.	tons.	tons.
Beef and veal	98,000	90,000	93,000	92,000
Mutton and lamb ..	156,000	101,000	118,000	107,000
Pig meats ..	31,000	26,000	25,000	26,000
Total ..	285,000	217,000	236,000	225,000

The meat production forecast for 1948 shows that beef, veal, and pig meats should be produced at the same level as last year, but that mutton and lamb production should be increased to 20,000 tons to make a gross production of 245,000 tons of meat.

[A.C.T.H.]

BACON PIG COMPETITION

To interest pig producers in improvement of the quality of pig meat for the home and export markets, bacon-pig competitions are to be held in which pig raisers may enter pigs and have their carcasses judged by the English appraisement method.

Substantial cash and trophy prizes will be offered by the Australian Meat Board for competition, and each competitor will receive a certified award card with full details of his pig's carcass.

The Board's Victorian competition which is being conducted with the co-operation of the Victorian Department of Agriculture, the Royal Agricultural Society of Victoria, and the Victorian Branch of the Australian Pig Society, will be held in Melbourne from the 12th

to 14th May, 1948, and at the same time the Victorian Branch of the Australian Pig Society will hold a pig-raisers' convention to deal with problems of the pig industry, and will sponsor a sale of stud pigs.

Public inspection of the competition pigs alive and dressed at the Melbourne Royal Show Grounds, an organized tour of inspection of the meat works where the competition pigs are treated and demonstrations on pig carcass inspection, grading and appraisal will be features of the three-days' programme, which promises to create unprecedented interest and should provide an excellent opportunity for all sections of the pig industry to get together and see and discuss problems of mutual interest.

The competition is not confined to stud-pig breeders, but is open to all pig breeders, and the entered pigs may be purebred or crossbred, provided their sire is purebred.

Each exhibitor may make two entries, each entry being one bacon pig from 120 lb. to 180 lb. dressed weight when slaughtered on the 12th May.

Entries, which will be accepted free of charge, will close on the 14th April. Forms may be obtained from Mr. W. E. Dawson, Victorian representative of the Australian Meat Board, 401 Collins Street, Melbourne, C.1.

[L. A. DOWNEY, H.D.A., Pig Expert.]

GRID CROSSINGS

Grids for motor vehicles to replace gates at entrances to properties and paddocks save much inconvenience in stopping for

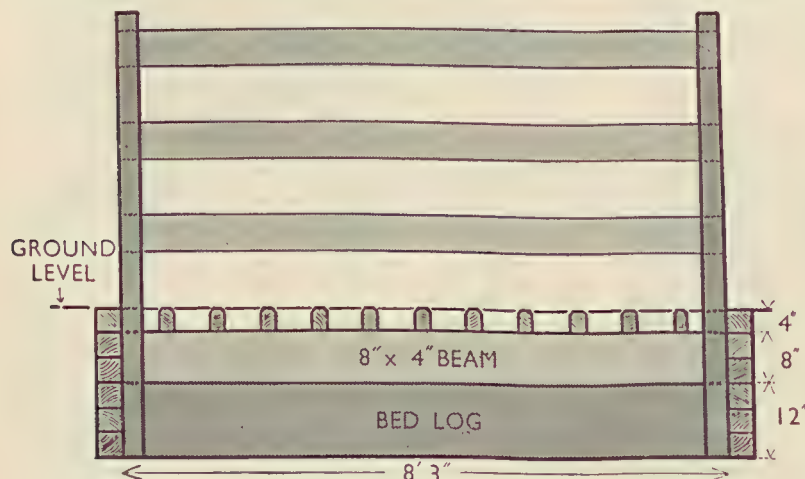
the purposes of opening and closing gates. Many types of grids are in use, but the diagrams shown here give a general idea of how one may be constructed. Grids have disadvantages in that stock may break their legs trying to cross them, while certain animals find ways and means of getting across them. Where grids are used, entrances with gates are also necessary for horse-drawn vehicles and livestock being moved on the hoof.

The grid shown in the accompanying plans is constructed entirely of timber, but other materials may be used. Two inch piping, light steel rails, or round wooden ones may be substituted for the 4-inch by 2½-inch hardwood gridrails, while reinforced concrete may replace the bedlogs and ends of the pit. However, wooden structures will probably have the widest application.

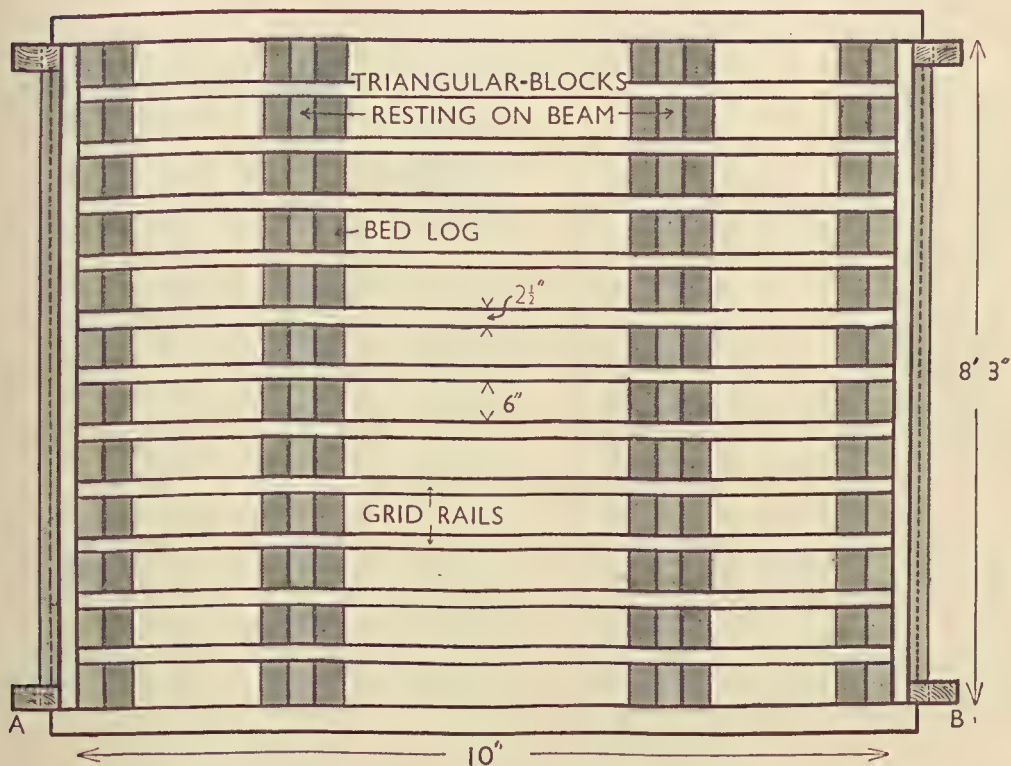
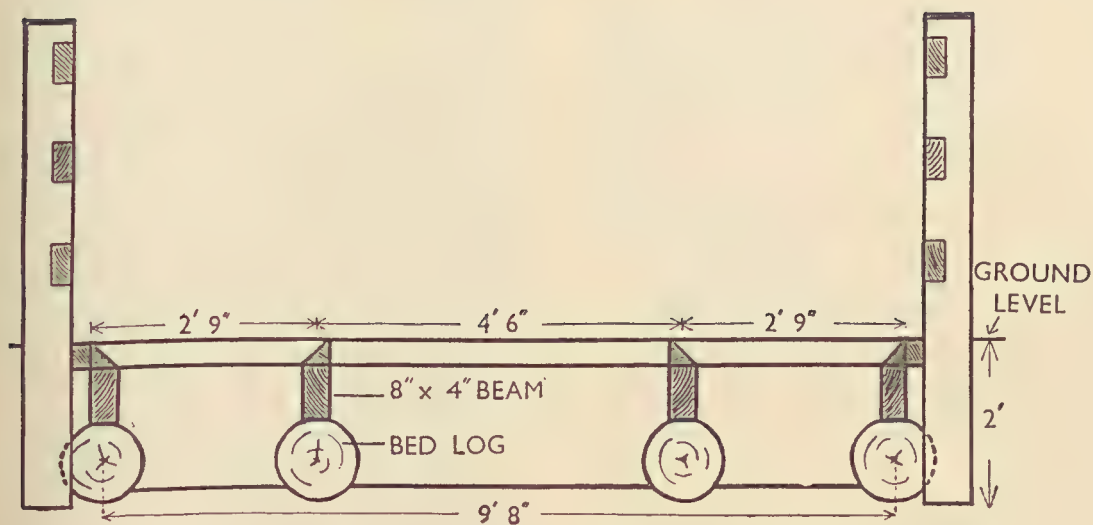
The grid is best built just inside the boundary fence, so that it does not project into the road. When used in sub-divisional fences, it may be erected half on each side of the fence, but side rails are necessary so that stock walking along the fences do not step into it. The pit is best dug to a depth of 22 inches, and the 12-inch bedlogs placed at a depth of 24 inches. This extra 2 inches gives the bedlogs a firmer foundation. The 8-inch by 4-inch beams are bored and spiked to the bedlogs.

The grid rails, spaced 6 inches apart, are spiked to the beams with flat-headed spikes 7 to 8 inches long. The top edges of these grid rails are bevelled to prevent damage to tyres. Triangular blocks of wood, 6 inches long and 4 inches wide at the base are nailed to the beams between each pair of gridrails. These blocks support the rails against the thrust of the wheels. Triangular blocks are used to prevent sheep attempting to walk along them. End boards of 4 inch by 4 inch prevent the pit from filling at the ends.

To prevent stock crossing at the corners, a fence panel is put in along each side of the grid. The posts will sit in closer to the grid if they are sunk into the bedlogs, as shown in the diagrams.



Side elevation of grid crossing.



PLAN

End elevation and plan of grid crossing.

If heavy traffic is likely to pass over the grid, then five bedlogs and beams may be used instead of four. However, the grid shown will prove adequate for most traffic, and support vehicles with a 3-ton capacity.

MATERIALS REQUIRED FOR GRID CROSSING

Item.	Number.	Size.	Length.
		diameter inches.	ft. in.
Bedlogs	4	12	8 3
Beams	4	8 × 4	68 3
Grid rails	11	4 × 2½	10 0
Side boards	2	4 × 2½	8 3
End boards	12	4 × 4	10 8
Piece to be cut for triangular spacing blocks	1	4 × 4	12 0
Fence posts	4	8 × 4	6 0
Fence rails	6	6 × 3	8 3
Spikes	100	..	7 to 8 inches
Nails for triangular spacing blocks ..	3 lb.	..	3 inches
Spikes to fasten beams to bedlogs ..	16	..	12 inches

PROFESSOR PETERSEN AND MASTITIS

Professor W. E. Petersen, Professor of Dairy Husbandry at the University of Minnesota, is well known to Victorian dairyfarmers who have seen his film "The Science of Milk Production". Professor Petersen, who has made a lifetime study of production and health of the dairy cow, says that dairyfarmers find mastitis to be the worst trouble of any affecting their herds. Almost every herd has some of it, yields fall, and the useful life of cows is greatly diminished; yet mastitis can be controlled. It will almost invariably be found that where mastitis is bad it is the farmer's own fault.

Mastitis is any inflammation of the udder caused by a large variety of organisms. *Streptococcus agalactiae* is one of the chief offenders and the most frequent cause of mastitis. This organism can now be controlled by penicillin, but, as Professor Petersen points out, this does not prevent the cows being exposed to more severe attacks of mastitis caused by *Staphylococci* and *coliform bacteria*. These organisms are living everywhere, but if the management of the cows is sufficiently good, there is no reason why any of them should cause trouble.

Mastitis may sometimes be cured by veterinarians, but only good management can prevent it. Some farmers rarely ever have a case of mastitis, whereas another farmer may have fresh cases occurring far too frequently. Without a very close check being made on the two farmers' methods, however, the reasons cannot be explained. In fact the farmer with the trouble may have apparently cleaner premises, but his management and handling of the herd usually is weak somewhere. Managing a herd is a very complex task, says the Professor. You have to be on the job all the time watching every detail. Major points to observe in a campaign for the prevention of mastitis are as follows:—

Accommodation.—Allow plenty of room for the cows in yards and sheds, and provide clean, dry, camping areas.

Cleanliness and Sanitation.—Keep the cows' udders clean; milk infected cows last.

Gentle Handling.—Guard against udder injuries by providing plain wide doors and gateways, sound fences that the cows cannot break through, pastures cleared of obstructions—old timber, baling wire, and old implements—paths free of mud and obstructions, and quiet yarding without dogs rushing the cows around.

Proper Milking.—Efficient milkers are essential. These employees should be capable of training cows to walk quietly into the milking shed, there to relax and let down their milk within a minute of having their udders washed with a warm cloth, when the warmed teat cups should be applied.

The milking machines should be kept in good working order and adjustments should be made in accordance with the manufacturer's instructions. When the cow is nearly milked out, strip by pulling down on the teat cups and massaging the quarters with the other hand. When the milking is finished the machines should be removed immediately.

It has now been shown that resistance of cows to mastitis is inherited. The greater incidence of mastitis today may be due to the use of bulls from cows which have little resistance to the disease, indicating a need for avoiding as far as possible

the use of bulls from cows which have broken down with the complaint. The use of bulls from cows with pendulous udders should also be avoided.

POULTRY BREEDING STOCK

Stud breeders who have trapnested or single-tested their stock, and those who have had their birds returned from the egg-laying competitions, should carefully examine these high-producing hens for any undesirable features that would eliminate them from the breeding pen. Apart from conforming to the standard of the breed, they should be robust, strong, and well-fleshed. White Leghorn hens should weigh not less than $4\frac{1}{2}$ lb., and heavy breeds not less than $5\frac{1}{2}$ lb., and their eggs should be of correct size, shape, and quality.

Breeders should strongly resist the temptation of selecting high-producing hens that are small, low-set, and lay eggs of less than 2 oz. in weight, even though the production is good. Size, within reasonable limits, appears to be almost indispensable, if high-egg production and constitutional vigour are to be maintained, but this must not be confused with coarseness.

It is possible to breed a strain of birds with length of body, width, depth of breast, good length of leg, and weighing approximately 5 lb., with strong, fine bone, and all the essential points to be found in high-class stock. If the choice lies between a big bird inclined to coarseness and a small high-quality bird, it is logical to select the small bird. There is no excuse for coarseness, and birds of this type should never be used for breeding, but if small birds are used, it is possible to increase the size in future generations by careful selection and breeding.

While striving to improve egg production it is advisable to endeavour to control external features such as size and texture of comb, length of leg, texture of feather, and to eliminate faults such as side sprigs, spurs on the legs of females, bumblefoot, and to breed a flock of birds so outstanding in conformation that they can be readily recognized as a distinct strain.

It is possible to breed a flock of birds with either long or short legs, broad or narrow backs, deep or round shallow breasts, hard or soft feathers, by regular, consistent selection.

The large commercial poultryfarmer who does not practise trapnesting or single-testing, should keep his special-quality birds in separate pens for the purpose of breeding male birds for the following breeding season. The soundest method of building up and maintaining a profitable flock is to select breeding stock by hand. Male birds should possess similar bodily characteristics to the hen, namely, straight breast, good abdominal capacity, fine, strong pelvic bones, good width across the back, hard feathers, and a strong upright comb of medium size. Birds with any of the weaknesses mentioned previously should not be used as breeders under any circumstances. The weaknesses reproduced in their progeny may take years to eliminate.

[M. D. HALL, Poultry Expert.]

BEEKEEPING

As the Grey Box is well-budded in some localities, a great number of colonies will be forced to use Grey Box stores for winter if the colonies are not moved to the Desert Banksia. Grey Box provides poor winter stores.

In conjunction with, and preceding the Grey Box bloom, Red Stringybark blossom occurs in many areas. It is wise to get the brood chamber filled with stringybark or any other good wintering honey, and leave it entirely for the use of the colony during winter.

Many apiarists remove several combs of brood from the bottom chamber, and replace them with full combs of good-wintering honey, forcing the bees for the time being to breed in the supers, and later on contracting them down on to the winter stores.

If one is migrating to Desert Banksia, it is unwise to remain on Grey Box after April. The apiarist may be induced by fair weather, and a continued flow of honey to remain longer, but it must be kept in mind that one week on the early Banksia flow provides a fairly substantial gathering of good winter stores which will keep the colonies in good condition until the spring.

Many apiarists have been disappointed with the wintering results on Banksia, but, in most cases, their arrival on to Banksia country took place after the cold weather had set in, and the bees were unable to

gather nectar from the bloom. Coupled with overstocking this is the cause of most poor colony conditions at spring-time.

To obtain full advantage of winter *Banksia*, apiaries should be placed right on the bloom, as they can utilize short periods of flying weather which are lost if the flying distances are too great.

Banksia blooms in different periods in localities only a few miles apart, according to weather conditions at bud formation, and the time of the last burn off.

If forced to use Grey Box stores for wintering, remove all unsealed stores, and make provision above the cluster for the escape of moisture. The migratory cover now in general use allows for this.

In the far west, Dergholm district, and across the South Australian border, many apiarists will be taking advantage of the Hill Gum bloom. Hill Gum often proves disastrous for winter stores if not accompanied by a good pollen and honey bearer, such as Brown Stringy Bark. As the Brown Stringy Bark promises a fair flow in these parts, apiarists would be wise to get the brood nests filled from this source, and rely entirely upon it for winter stores. The Yellow Gum in these areas shows promise of a fair bloom, and any labour entailed in these manipulations and extra movements which have to be carried out, should prove beneficial.

[W. A. COLLINS, Apiary Inspector.]

SMUT IN OATS

Of the two types of smut commonly found in oats, known respectively as Loose Smut and Covered Smut, the former is the more common in Victoria. In Loose Smut, the glumes (chaff) and the grains are replaced by a black mass of powdery spores, whereas the glumes of plants infected with Covered Smut are not involved, and the grain alone is replaced by black spores. Loose Smut is thus more easily picked out in the crop before it is harvested.

In both diseases, infection takes place in the seedling stage by means of spores carried on the seed. This is unlike wheat, in which the spores of Loose Smut of wheat are carried within the grain, and can only be killed by hot water treatment, which is impracticable on the farm.

Infection of oat grains with spores takes place either before harvest (by windblown spores) or at harvest time. Many spores

lodge under the hull, making the treatment of infected oats more difficult than wheat.

The procuring of seed from a clean crop is advisable. However, if this is not possible, seed from infected crops should be pickled before sowing. If the infection was not heavy, copper carbonate is satisfactory, but in badly affected crops, the use of a mercury pickle (e.g., Ceresan or Agrosan) 2 oz. per bushel is recommended.

Best control is given by wet pickling with formalin, a solution of 1 in 400, at the rate of 1 gallon per bushel, but this treatment is more difficult to apply than dry pickling, and the seed should be sown immediately after treatment. Another means of control of oat smuts is by the use of resistant varieties, but this approach has not yet been fully developed in Victoria.

[Contributed by the Agricultural Division.]

PASTURE INVESTIGATIONS

in Gippsland, Central and North-Eastern Districts

By G. W. HEXTER, B.Agr.Sc., Assistant Agrostologist

Extracts from the 1946-47 Annual Report of the Department of Agriculture to the Victorian Pasture Improvement League.

GIPPSLAND

RESULTS obtained from experimental plots in Gippsland continue to emphasize that the most important fertilizer in this area is superphosphate, but on some soils other fertilizers or soil ameliorants are needed in addition if the pastures are to make the full use of the superphosphate applied.

As a supplement to superphosphate the use of lime in several places in Gippsland is a valuable and economical aid in the development of improved pastures. The acidic coastal scrub lands and the volcanic red hill soils respond favorably to the application of lime; lesser but useful results are being obtained on the grey hill soils derived from Jurassic mudstones.

It has been demonstrated effectively both on experimental plots and by enterprising farmers that good pasture can be developed on "plains country," such as is found between Inverloch and Foster, by applying ground limestone at the rate of 10 cwt. per acre before sowing down a standard mixture with a liberal dressing of superphosphate.

Small annual dressings of lime, either mixed with superphosphate or applied as independent dressings, give much poorer results than where the lime is applied in one heavy dressing before sowing down. The former practice is not recommended on that account.

Poor pastures characterized by the appearance of second-class grasses and a small proportion or complete absence of clover in the sward resulting from the exhaustion of

soil potash, are evident in many parts of Gippsland. These cases of potash deficiency are probably related to exhaustive systems of farm management rather than to soil type. They should serve as a warning to farmers that the exploitation of farm land in Gippsland should be halted and that more attention should be given to the conservation and use of farmyard manure.

The rotation of night and crop paddocks can play a large part in the correction of potash deficiency, so reducing the need for the use of potassic fertilizers.

Results from the use of so called minor or trace elements have not been marked up to date, but small responses, notably from copper sulphate, have been obtained on acidic coastal scrub country. It is not possible at present to say whether these results are economical or not.

Callignee—S. D. Lamperd

Average rainfall 40.95 inches. Soil type—dark brown loamy clay, with odd weathered stone and quartz gravel (pH = 5.3).

The effect of superphosphate on this plot is limited by a potash deficiency in the soil, which has resulted from continual removal of hay from the paddock without the return of a corresponding amount of mineral plant food. A good response to muriate of potash has therefore occurred on this plot, particularly during the autumn and spring months.



Pasture flat at Yanakie, showing development of white clover following liberal applications of superphosphate. The grassy foreground received no manure.

the early years, but more recently has been little if any better than superphosphate and lime without the nitrogenous fertilizer.

In the first year, there was a good response to sulphate of ammonia when used with superphosphate but without lime however, in subsequent years, this response became indefinite and in later years, has changed to a depression in vigour, and the botanical composition of the sward has deteriorated.

A response to potassic fertilizers has been evident throughout the trial, and this is manifest by a much better development of

clovers where this fertilizer has been applied.

Lime at the rate of 1 ton per acre has produced little result, the best response being obtained when it was used in conjunction with superphosphate and potassic fertilizers.

Thistles, cape weed, ribgrass, flatweed, and hairgrass continue to be troublesome on this plot.

Ellinbank—H. Cross

Average rainfall 40.86 inches. Soil type—friable brown clay loam with small ironstone concretions (pH = 5.5). Volcanic in origin.

The grazing manurial trial at this site was established in 1935, and consisted of a number of small paddocks each receiving a different manurial treatment. These small paddocks are grazed in conjunction with the large paddock in which they are situated.

The pasture at the commencement of this trial consisted of Yorkshire fog, flatweed, and ribweed, together with some weak cocksfoot and perennial rye grass.

During the eleven years of the trial, there have been satisfactory improvements in the composition of the pasture and its productivity where super. has been used at rate of 1 and 2 cwt./acre and additional improvements from lime. The combination of superphosphate, lime, and sulphate of ammonia showed up to advantage during

The response to lime which was evident in the early years of this trial has not been as marked in later years, and an extra dressing of lime in 1943 did not produce a further stimulus to growth.

The withholding of manurial dressings in 1942 showed a good residual response to superphosphate but little or none to potassic fertilizer, indicating that if this fertilizer is to be used it would need to be applied annually.

In the spring of 1942 a mowing manurial trial was established to ascertain the relative merits of superphosphate, basic superphosphate and serpentine superphosphate. The results from both basic superphosphate and serpentine superphosphate were inferior to those from superphosphate.

No definite result was obtained from dressings of molybdenum in 1945 and 1946.

As results had reached a conclusive stage during 1946, it was decided to terminate these plots at the end of the year.

Fish Creek—A. Cunningham

Average rainfall 38.64 inches. Soil type—light, grey-brown loam derived from Jurassic sediments (pH = 5.5).

The Fish Creek plot was established in the spring of 1944. During 1946, there have been progressive responses to superphosphate when applied at rates of from $\frac{1}{2}$ to 4 cwt./acre. With 4 cwt./acre/annum there has been a marked development of white clover, and where $\frac{1}{2}$ ton/acre of ground unburnt limestone was applied in 1944, the stock show a definite preference for these strips.

There has been no visible response to muriate of potash up to date.

Foster No. 1—J. Hunter

Average rainfall 45.33 inches. Soil type—grey loam to fine sandy loam (pH = 5.3).

When used alone, superphosphate and other phosphatic fertilizers continue to give negligible results on this plot. Superphosphate and potassic fertilizers applied together, however, promote a vigorous growth of white and subterranean clovers. Lime has not shown to advantage on this plot, as the whole area was limed some years before the trial was begun.

Copper sulphate first applied in 1944 gave slight responses in pasture growth in the early spring of 1945 and 1946. The rate of application was 10 lb./acre in 1944 and 1945, and 20 lb./acre in 1946. A good response to copper sulphate is apparent only for a short period during the springtime.

Foster No. 2—J. Davies

Average rainfall 45.33 inches. Soil type—black silty loam with a large amount of undecomposed organic matter, and poorly drained (pH = 5.3).

This trial, now in its second year, was established on virgin land known locally as "plains country". A description of this type of country was given in last year's annual report.

Applications of superphosphate up to 2 cwt. per acre have strengthened the growth of fog grass, but have not greatly increased the growth of clovers, and where these

relatively small applications of superphosphate have been used, the re-growth of scrub is fairly rapid.

Annual applications of 4 cwt. and 8 cwt. of superphosphate however, have promoted good growth of subterranean, white and red clover, and re-growth is not troublesome on these strips.

With the clover growth is associated a development of vigorous perennial rye grass plants.

Where the pasture has received an initial dressing of $\frac{1}{2}$ ton of ground agricultural limestone per acre, annual applications of 2 cwt. of superphosphate have produced as good, if not better, results than 4 and 8 cwt. of superphosphate applied annually, but with no initial dressing of lime. Despite the extreme shortage of phosphorus in this soil, the application of finely ground rock phosphate at 1 cwt./acre has given very poor results, while at this rate of application reverted phosphates are inferior to superphosphate in promoting pasture development.

There has been no response from potassic fertilizers on this plot up to date. A mixture of copper sulphate, zinc sulphate, and ammonium molybdate has given no results so far. As in the first year of the trial, there has been no noticeable improvement from inoculation.



With adequate superphosphate, pastures of perennial rye grass and white clover can be maintained in the higher rainfall districts. The pasture illustrated is at Yanakie and was sown in 1940. It receives an annual dressing of one bag of superphosphate.

During 1946, a trial was commenced to determine the best method of establishing pasture on this "plains country". The land has been broken up and preliminary cropping will begin during 1947.

Inverloch—H. Anderson

Average rainfall 38·29 inches. Soil type—dark brown-grey clay loam (pH = 5·7).

In the spring of 1946 a trial was commenced on this property to determine the best method of establishing pasture in the Inverloch district. Various crops, such as oats, rape, and potatoes, were sown and planted and these will be followed by pasture at a later date. This should give an indication of the best preliminary treatment to give the land before sowing down to pasture.

Leongatha—C. Stockdale

Average rainfall 38·93 inches. Soil type—grey-brown volcanic loam (pH = 6·3).

A pilot manurial plot was established on this property in 1942, and in the following year a second manurial plot was put down to compare the relative responses to basic superphosphate, serpentine superphosphate and ordinary superphosphate.

Superphosphate alone gave marked responses which were progressively better as the rate of application increased from 90 lb. to 360 lb. per acre, but the limit of practical application appears to lie between 180 and 224 lb. per acre with reserves of soil phosphate as they are at present.

Basic superphosphate and serpentine superphosphate, while giving good results, have generally been inferior to superphosphate. Ground rock phosphate gave poor results during 1946.

In years previous to 1946, there have been good responses to lime and smaller responses to potassic fertilizers when used in conjunction with superphosphate, but during 1946 no marked improvement from lime was evident and a response to potassic fertilizer did not occur.

Traralgon—J. Stockdale

Average rainfall 28·86 inches. Soil type—brownish-grey loam (pH = 6·0).

In the autumn and the winter there was a small response to superphosphate, but even when applied at the rate of 360 lb./ac. this response was not evident in the spring. Where muriate of potash was applied in conjunction with superphosphate, there is a vigorous development of subterranean clover with a healthy stand of perennial rye grass. In the absence of potash there is little or no clover in the pasture, except where cow "pats" have been, and the rye grass makes little growth and is yellowish in appearance. The residual effect of cement ash, pronounced in the first 2 to 3 years, is no longer visible.

It is intended in 1947 to commence a trial to determine the most appropriate quantities of superphosphate and potash to apply to pastures similar to that on which the plot is situated.

Yanakie—J. Davies

Average rainfall 45·33 inches. Soil type—black silty loam with high content of undecomposed organic matter (pH = 4·9).

The Yanakie plot is situated on country very similar to Foster No. 2, but of a more undulating nature and where liberal amounts of superphosphate have been applied in the past. Nevertheless, during 1946, the response to superphosphate was good, but the response to basic superphosphate was slightly inferior to superphosphate. In the autumn and early winter the stock showed a preference for the strips receiving lime. This was the only evidence in 1946 indicating a response to lime.



Irregular distribution of superphosphate promotes uneven growth of sub. clover. The white areas in the picture are the flowers on the clover plants showing through undeveloped foliage.



‘Mite’ is not right

During the winter months apple and pear trees are gathering strength for the next fruit season. Their dormant period is an active one for the orchardist, for an infestation of the European red mite and the Bryobia mite can build up rapidly, if control is not established with the proper spraying routine.

Shell recommend the use of Shell Palespray at 1 in 15-20 in the late dormant season. For complete effectiveness the spray must penetrate to the underneath sides of the fruit spurs and the junction of twigs and branches.

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There was no response to muriate of potash or to minor elements on this plot.

Poowong—

A. G. Buchanan

Average rainfall 43.10 inches. Soil type—light grey-brown loam derived from Jurassic sediments.

The most interesting feature of this plot, which has been established two years, is the vigorous development of white clover on the strip of pasture receiving 4 cwt. of superphosphate per acre per annum; and as at Fish Creek, there is also a response to lime, while the stock show a similar preference for the limed areas.

As yet there is no response to muriate of potash used in conjunction with superphosphate or with superphosphate plus lime.

Longwarry—V. G. Harvey

Average rainfall 35.31 inches. Soil type—grey loam overlying gritty sub-soil.

During 1946, there has been a limited response to superphosphate and half a bag/acre appeared to be the most economic amount to apply. The extremely wet conditions on these flats during 1946 have retarded pasture growth and probably limited responses to all fertilizers.

Muriate of potash applied with superphosphate gave a marked response. Cement ash also continued to give good results, although not as good as where annual dressings of muriate of potash have been applied.

No response to lime was evident during 1946.

In the autumn of 1946 a further trial was commenced to determine the best rates of application of superphosphate and muriate of potash to use on exhaustively farmed land, similar to that on which the small plot is situated.



Mr. J. H. Sutherland of Yarck inspects an improved pasture of perennial rye grass and sub. clover sown down after 2 crops of oats and topdressed each year for the past 13 years with 100 lb. of superphosphate to the acre.

CENTRAL DISTRICT

The problem of improving soil fertility in this part of the State is basically the same as in other districts, namely, the supplementing of inadequate reserves of phosphate in the soil by the use of superphosphate, and, in addition, there is a need for lime, potash and possibly molybdenum in certain areas.

The land most responsive to lime is the poor silurian hill country with some shale showing at the surface and a clay sub-soil not far below. Such land is to be found at Wandong, Whittlesea, Lilydale, and in adjoining areas.

Potash deficiencies usually occur where the land has been treated exhaustively irrespective of soil type.

On the drier parts of the basaltic plain country, temporary pastures of various species of trefoil, early varieties of subterranean clover and Wimmera Rye grass can be developed by topdressing, but where more permanent pasturage is required, *Phalaris tuberosa* could be substituted for the annual rye grass.

As one moves into the parts of the Central District where rainfall conditions become more favorable, then perennial rye grass can be maintained as a permanent element in the pasture and would be preferable to *Phalaris tuberosa* except under special

circumstances such as on heavy soils on low lying areas. An excellent strain of perennial rye grass occurs in the Kyneton area, and certified seed of this strain is harvested and made available in commerce.

Buxton—H. Robb

Average rainfall (Marysville) 53·52 inches. Soil type—grey gritty loam with slight quartz gravel (pH = 5·9).

The Buxton plot was established in the autumn of 1946. The pasture prior to this, consisted mainly of native grasses. In order to establish some responsive species in the pasture, the plot was cultivated three times to a depth of 2 to 3 inches with tandem scalloped discs, and some subterranean clover and phalaris seed was sown. As yet, there have been no definite results from this trial.

Clonbinane—A. G. Jowett

Average rainfall (Heathcote Junction) 27·9 inches. Soil type—brownish grey loam (pH = 5·6).

This plot was established on wallaby grass country in the autumn of 1946. The plot was rotary hoed prior to topdressing, and subterranean clover and *Phalaris tuberosa* were sown when topdressing. Up to date, the establishment of *Phalaris* has been poor.



Note contrast between the "no manure" pasture in the foreground and the manured plot beyond the fence. The manured pasture, which is located at Wangaratta, receives a dressing of superphosphate each year.

There has been a good response in annual grass and clover growth to superphosphate, but as yet no results have been obtained from lime, potash or minor elements.

Wandong—R. F. Ryan

Average rainfall (Heathcote Junction) 27·9 inches. Soil type—brown-grey fine sandy loam with some stone derived from Silurian sediments (pH = 5·3).

Established in 1945, the results in the first year of this trial have been repeated during 1946.

Superphosphate alone has had little effect on legume growth but has stimulated grass growth, particularly the annual species.

Ground agricultural limestone applied at the rate of 10 cwt. per acre as an initial dressing prior to sowing down, has, with annual applications of 2 cwt. of superphosphate/acre promoted an excellent growth of subterranean clover.

There is still no improvement in the sward from inoculation of legume seed with nitrogen-fixing bacteria.

Yarck—J. H. Sutherland

Average rainfall (Alexandra) 27·57 inches. Soil type—light grey fine sandy loam (pH = 5·7).

This plot was established in the autumn of 1946 on a pasture consisting of about 75 per cent. subterranean clover and 25 per cent. wallaby grass. There have been marked responses to superphosphate. Used at the rate of $\frac{1}{2}$ cwt./acre it produced a very good response, and the improvement was progressively better with dressings up to 2 cwt./acre indicating the need for liberal topdressing in the initial stages of pasture improvement.

Basic superphosphate produced an inferior response to superphosphate

and there were no responses to lime, muriate of potash, rock phosphate, or minor elements during the first year of the trial.

Coldstream—J. Doake

Average rainfall (Lilydale) 34.90 inches. Soil type—light brownish grey loam derived from Silurian sediments (pH = 5.6).

A complete summary of the results of this trial is contained in the previous annual report.

During 1946 there was an increase in vigour of rye grass, but no encouragement of clover growth when superphosphate was used alone at rates of 2 and 4 cwt./ac. Results from applications of muriate of potash have again shown that the limiting factor in pasture production on this plot is potash. Only small responses to lime have been evident during 1946 and no differences were observed between burnt lime and agricultural lime.

The pastures on this plot have been subjected to more severe grazing this year, and it is hoped that the percentage of fog grass in the sward will be lessened with this treatment.

Seville—F. T. Lewis

Average rainfall (Yarra Junction) 47.45 inches. Soil types—red volcanic loam and shallow grey clay loam overlying silurian sediments.

The grey soil on this property continues to respond to dressings of superphosphate plus molybdenum, whereas superphosphate alone gives relatively poor results. As yet, no benefit has been obtained from molybdenum on the red soil.

NORTH-EASTERN DISTRICT

In general, subterranean clover will flourish in most parts of the north-east when superphosphate is used, the main problem being to develop and maintain a suitable balance of grass and clover.



Phalaris tuberosa established on an old subterranean clover paddock at "Seven Creeks", Euroa. The clover paddock was disc-ploughed in September, 1945, and 2 lb. of *phalaris tuberosa* seed was sown immediately. The pasture receives an annual application of 1 cwt. of superphosphate.

Excepting in the better rainfall areas in the river valleys, perennial rye grass is short-lived and is only suitable as an associate species to Wimmera Rye and subterranean clover for temporary pasture. On the other hand, *Phalaris tuberosa* grows exceedingly well in most parts of the north-east, and with subterranean clover, makes a very satisfactory pasture for sheep or cattle.

While phosphate is generally deficient, this is not so with lime, but there is evidence of a deficiency on some of the soils adjacent to granitic outcrops.

Euroa—R. F. Kelsall

Average rainfall 25.20 inches. Soil type—grey-brown sandy clay loam (gravelly) (pH = 5.5).

A good response to superphosphate is apparent in the pasture plot on this property and it is progressively better where from $\frac{1}{2}$ to 4 cwt./acre of superphosphate has been applied.

Other types of phosphate, notably basic superphosphate, serpentine superphosphate and poorly soluble rock phosphate have given results inferior to those from superphosphate. There have been no responses to lime or potassic fertilizers on this plot.

Growth on this plot has been very good this year, and owing to difficulties in grazing management, differences during the spring were not as clearly defined as is usually the case.

Euroa—K. Stribling

Average rainfall 25·20 inches. Soil type—grey-brown coarse sandy loam with slight quartz and gravel (pH = 5·3).

In the 1945–46 report on this plot, the following statement was made:—"Although results to date have been limited by dryness, it appears, that given a reasonably good season, very marked responses to superphosphate and to lime will occur on this plot." The anticipated result has occurred during the past year. There have been good responses to superphosphate increasing progressively with applications ranging from $\frac{1}{2}$ cwt. up to 4 cwt./acre/annum. It is doubtful whether the strip receiving 4 cwt. of superphosphate/acre/annum, i.e., 12 cwt. since the commencement of the trial in 1944, is as good as the strip which has had 10 cwt. of ground limestone the first year and annual dressings of 2 cwt. of superphosphate per acre since.

Lime and superphosphate have encouraged the growth of annual clovers, such as suckling, cluster, hop and hare's foot and subterranean clover.



In the absence of a strong perennial grass, *Erodium botrys* invades the sward.

There have been no responses to muriate of potash or minor elements, and reverted and poorly soluble forms of phosphate have been inferior to superphosphate in their effect on plant growth.

Euroa—Mrs. A. MacIsaac

Average rainfall 25·20 inches. Soil type—brown-grey loam (pH = 5·6).

There is a large initial response when $\frac{1}{2}$ cwt./acre of superphosphate is applied with additional smaller responses as the rate of topdressing is increased to 4 cwt./acre. Superphosphate not only increases clover growth but also encourages such annual grasses as Soft Brome and Hair Grass.

Ground limestone applied as an initial dressing of 10 cwt./acre with annual applications of 2 cwt. of superphosphate has stimulated a more vigorous growth of pasture than when superphosphate alone was applied.

It was hoped that the strong growth of pasture would control storksbill, and although this did occur during the active growth period there is still a good residue of weed seeds and the advent of a dry autumn might mean a vigorous regrowth of weed due to the build-up in soil fertility that has occurred during the past season.

There has been no response to muriate of potash and reverted forms of superphosphate have been generally inferior to superphosphate.

Kergunyah—I. Wallace

Average rainfall 34·41 inches. Soil type—brown-grey sandy loam with iron concretions (pH = 6·1).

The lay-out of this plot consists of a grazing manurial trial on which the effect of various fertilizers on pasture growth are observed, and a pasture species trial.

Of the various fertilizers used, superphosphate has given the most spectacular results, and it has been a noticeable feature of the trial that while $\frac{1}{2}$ cwt./acre has stimulated a strong growth of subterranean

clover, the development of perennial rye grass has been relatively poor, but where 1 cwt./acre or more is applied annually, a vigorous growth of perennial rye grass has occurred.

Lime has given small responses on this plot, particularly in the early stages, and in the late spring of 1946 it was noticeable as a slightly stronger growth of perennial rye grass. There have been no responses to potassic fertilizers on these plots.

The important pasture species present on this plot are perennial rye grass, subterranean clover, and *Phalaris tuberosa*. On the fertile river flats, perennial rye grass and subterranean clover predominate in the sward when pastures are adequately topdressed with superphosphate. On the rising country of the Kiewa Valley, soil moisture conditions in the summer are inadequate for the requirements of perennial rye grass; *Phalaris tuberosa* is the most suitable perennial grass for this type of country. *Phalaris tuberosa* and perennial rye grass grow well together where soil moisture is sufficient, but owing to severe competition in the seedling stage, the *Phalaris tuberosa* should be established before the rye grass if a pasture containing both these species is required.

Both Kentucky blue and kikuyu grass do well, but are difficult to eradicate if it is desired to cultivate for cropping.

Best results with subterranean clover would probably be obtained from a mixture of "Bacchus Marsh," "Mt. Barker," and "Tallarook" varieties.

Red clover has been short lived and Palestine strawberry clover, although preferentially treated, was unable to compete with the vigorous growth of annual clovers.

Mansfield—L. J. Graves

Average rainfall 27·81 inches.

The Mansfield plot was established in the autumn of 1946 on a thick but weak stand of subterranean clover. The only positive



Phalaris tuberosa sown at the rate of 1 lb. per acre after a summer fallow supplements the clover and prevents the entry of undesirable species.

result to date has been a good progressive response to superphosphate when applied at rates ranging from $\frac{1}{2}$ to 4 cwt./acre. The minor elements, copper, zinc, manganese, molybdenum, and boron applied as a mixture have not given any growth response so far.

Wangaratta—S. Webb

Average rainfall 24·94 inches. Soil type—light brown fine sandy loam (pH = 5·7).

In addition to a grazing manurial trial and a pasture species trial, there has been added an establishment trial with *Phalaris tuberosa*, lucerne, perennial, and Wimmera rye grass.

The main soil deficiency at this plot is phosphorous. The grazing manurial trial shows marked responses to superphosphate up to 2 cwt./acre. Applications above $\frac{1}{2}$ cwt./acre have so increased fertility that with lenient cattle grazing annual grasses such as barley grass and the brome grasses have become conspicuous in the sward. There have been marked responses to lime, though during 1946 these were of a smaller order than formerly.

As yet there has been little or no response to potassic fertilizer under grazing conditions.

The original area selected for a trial of pasture species was an improved subterranean clover paddock. Rye grasses established well in this section, but did not persist and were replaced by high fertility demanding annual grasses such as barley grass and other annuals.

Phalaris tuberosa, however, has persisted well, and the strip sown with this grass now provides an outstanding demonstration of control of undesirable species by use of the correct pasture plants.

Lucerne established on the second species trial area in 1944 by an autumn sowing at 4 lb./acre after summer fallow, has made very satisfactory progress. *Phalaris tuberosa* sown at 1 lb./acre in another part of this paddock at the same time after similar preparatory treatment, is also making satisfactory progress.

The mixed pasture of perennial, Wimmera rye grass, and sub-clover is still persisting, but there is only a sparse representation of perennial rye grass.

BOOK REVIEW

BULLETIN 38.—ADVANCES IN GRASSLAND HUSBANDRY AND FODDER PRODUCTION, SECOND SYMPOSIUM

This bulletin is a Second symposium on "Advances in Grassland Husbandry and Fodder Production." Bulletin 32 was the first. The two bulletins are akin to the earlier "Herbage Reviews" series.

The bulletin opens with four articles and the remainder of the "symposium" is a series of summaries, in some instances lengthy, of eleven papers and reports of diverse origin and objective.

The first article on objectives in veld investigations in Southern Rhodesia by West and Rattray gives an excellent appreciation of the problems of veld management and the techniques to be used in the investigations. The similarity of environment to coastal and sub-coastal Queensland gives added interest to the Australian reader. A short article on the economics of ley farming by A. W. Ashby follows. This is mainly of local interest. Professor Travin's discussion on "Formation of Plant Species" is an aspect of geo-botany which is not commonly included in an agricultural botany publication. Travin deduces a correlation between the process of species formation and seismic and volcanic activity and associates new species formation with regions of young geo-synclines. The statistical data presented are not particularly convincing. The fourth article is on "Forage production in Switzerland"—a translation by Miss Roseveare from the German by Alfred Kauter. This article traces the intensification of cropping and sown pastures for a period of ten years, including the war period, largely because of the urgency of increasing

home food production. The methods adopted included intensive extension work and some measure of compulsory ploughing and cropping.

The summaries of papers follow and include two of Australian origin, Schofield's study of coastal pastures at South Johnstone, Queensland, and Andrew's report on "Pasture Investigations in Victoria," during 1944-45. The other nine summaries are:—

A Scottish Method of Grassland Improvement.

Agricultural Seed Production as a New Industry in Welsh Farming.

Grassland Research and Advisory Work in Sweden.

Birdsfoot Trefoil as a Forage Legume.

Hay Dehydration in the South-Western United States.

U.S. Regional Pasture Research Laboratory.

Weeds in Fiji.

Pastures and Fodder Plants in Sierra Leone.

Land Resources of Tripolitania.

The subjects of this bulletin are both interesting and valuable, but it is scarcely a symposium; rather is it a review.

(Reviewed by J. Griffiths Davies,
Principal Agrostologist, C.S.I.R.,
Division of Plant Industry.)

Note.—Copies of the publication can be obtained at a cost of six shillings (Sterling) from the Imperial Agricultural Bureaux, Central Sales Branch, Agricultural Research Building, Penglais, Aberystwyth, Wales.



By L. A. DOWNEY, H.D.A., Pig Expert

THE illustrations on the next two pages feature some aspects of a well-conducted piggery on the farm of the Melbourne Benevolent Asylum, Cheltenham.

Most of the farm is devoted to the production of vegetables for use at the home, while the piggery, using a very small area of ground, is conducted for the purpose of using the food refuse from the Home's kitchen and the vegetable farm, and to provide much needed manure for the sandy soil of the farm.

The outstanding feature of the piggery is its high standard of sanitation.

About 80 pigs are kept; they are purchased as small stores and carried on to bacon weights. No breeding is done.

The pigs are kept entirely in intensive pens which have brick and concrete walls and floors, and are completely roofed with

iron. The fronts are open to the east while the other sides are closed except for small adjustable ventilators on the west side.

The pen floors comprise three sections. One, where the pigs sleep, is raised about 3 inches above the surrounding floor and is provided with straw bedding, while the feeding section with the trough fixed along the front wall of the pen drains towards the dunging section, to simplify cleaning. The pens are swept and flushed out every day, the solids being taken to a nearby manure pit while the washings drain into a sewer.

The pigs' food is almost entirely kitchen refuse which is conveyed by trolley from the kitchen to the piggery where it is cooked by steam.

Special measures taken to control flies have been very successful during the past summer. These measures consisted of (1) spraying the internal walls and roof of the piggery with a preparation containing

D.D.T., and (2) the covering of the food-holding vat and the nearby manure pit with wire gauze fitted to movable frames at a cost of about £6 for materials.

Fig. 1.—The manure pit which is situated on sloping land about 12 feet from the pig pens is built of bricks faced with concrete. It is 20 feet long, 8 feet wide, and 3 ft. 6 in. deep. The wire-gauze covers at one end have been removed, as have the slide boards on which they rest, while the manure is shovelled into the lorry to be taken to the vegetable plots.

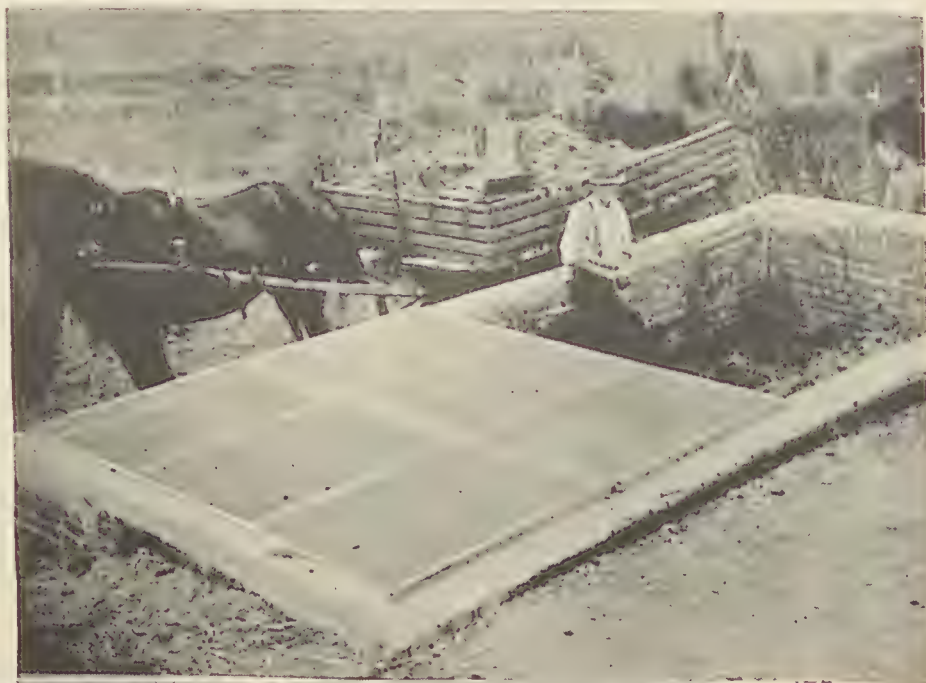


Fig. 2.—One of the fly-proof covers is removed here to allow manure to be tipped into the pit from the high side. By spraying the gauze covers with D.D.T. preparation, any flies trying to get into or out of the pit, succumb to the poison.

When the writer visited this piggery recently to see the effectiveness of the fly-control measures, it was only after a careful search that he found about ten flies at the piggery, and that was on a day when flies were seeking shelter indoors

from a strong cool wind. As a check, other piggeries in the same district were visited on the same day and flies were found there in the large numbers that are usual in piggeries where kitchen refuse or milk is fed to intensively-housed pigs.

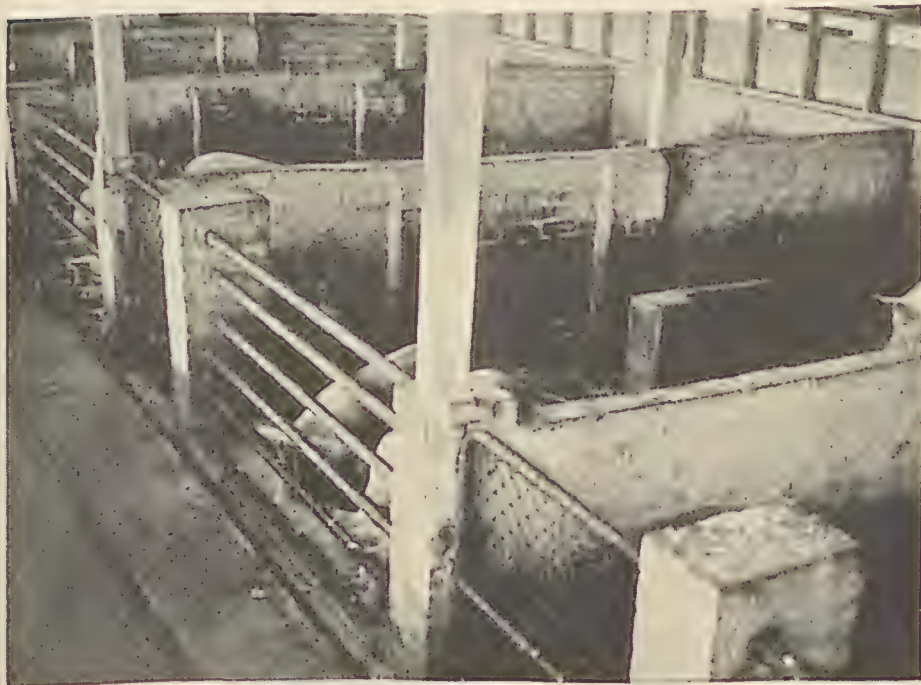
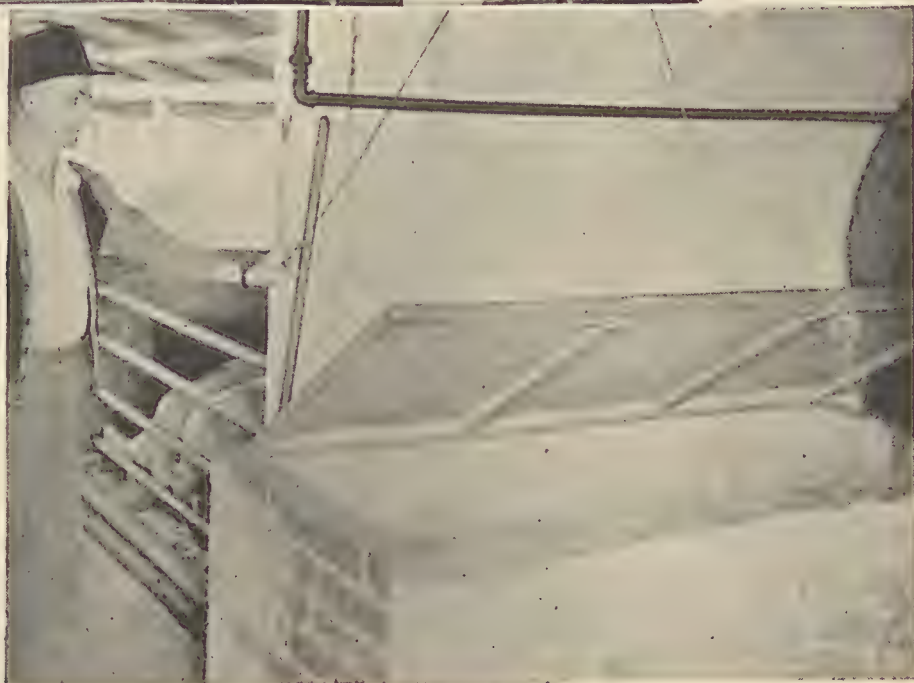


Fig. 3.—A view of some of the pig pens showing the piping let into the brick walls above the concrete troughs. This arrangement facilitates the feeding and cleaning operations and allows light into the pens.

Fig. 4.—The fly-proof lid of the food-holding vat is hinged and is easily opened by pulling the attached cord.



DOOKIE AND LONGERENONG AGRICULTURAL COLLEGES

FINAL EXAMINATION RESULTS, 1948

The annual graduation ceremony held this year at Dookie Agricultural College was attended by the Hon. the Minister of Agriculture, Col. A. H. Dennett, M.L.A., who presented the special prizes for class and practical work.

In an address to the students, the Minister stressed the great value of the College Diploma as an indication of the high standard of training received in scientific methods in agriculture at Dookie. A record number of 134 students attended the College in 1947, including 34 students doing the second year of the Melbourne University Agricultural Science course. Of the 40 Diplomas awarded, seven were gained with First-Class and seventeen with Second-Class Honours. This is a record for the College.

Congratulating graduates on the number of high honours passes gained, the Minister impressed on all that the great test of their training was their ability to think for themselves. Students would discover, when they undertook practical work on their own farms, the great benefits they had derived from their training at Dookie.

DOOKIE COLLEGE EXAMINATION RESULTS IN ORDER OF MERIT

Dux of College — Gold Medallist — M. T. Lacey.

Diplomas in Agriculture

With Honours, Class I.—M. T. Lacey, W. J. Arnott, D. L. Honybun, G. T. Wright, R. E. A. Strickland, R. L. Auld, A. J. Flockart.

With Honours, Class II.—I. D. MacInnes, J. S. Scougall, J. D. Williams, G. G. Clough, D. R. S. White, P. M. Hood, C. R. Preston, I. W. McDonald, D. F. Menadue, M. Walker, A. B. Murdoch, G. Whitaker, J. R. H. Phillips, T. W. Slessar, R. F. McCrickard, J. A. Sawyer, D. B. James.

Pass.—D. A. Bruce, P. W. Reilly, J. C. Larritt, J. D. Butterworth, I. McWilliams, E. G. Harrison, R. E. Kelly, J. C. Andrews, R. O. Morris, C. C. Stedman, J. de la P. Beresford, I. B. Reid, R. P. Holdenson, H. R. Brooke, L. A. Jager.

Passed at Supplementary Examination.—F. J. Dowling.

Granted Supplementary Examination.—V. G. Holland, A. F. Farvis, P. W. Kavanagh.

University (in alphabetical order).—J. D. F. Black, D. J. Cannon, N. A. Curnow, G. R. Davis, I. A. Dean, J. C. Eagle, T. N. Edey, J. R. Franklin, K. D. Gamble, R. Griffin, A. W. Harrison, I. N. Hawker, K. B. Higgins, R. O. Kefford, F. J. E. Kendall, D. F. Langridge, L. C. Lee, P. L. Lemaire, T. N. MacLean, M. J. Mason, D. R. Paterson, F. S. Richardson, Meredith J. Rigby, A. Righetti, L. I. Roach, J. E. Slee, J. M. Stevens, R. C. Sykes, R. H. Taylor, M. E. Wright.

Result Deferred in One Subject.—I. E. Cozens, K. W. Hayes, A. E. Matthews, R. A. VanBaer.

SECOND YEAR.

Pass.—J. B. Stuckey, P. W. Webb, N. W. Sims, J. Brockwell, F. R. Fogarty, J. C. Banfield, J. T. Green, J. H. Murray, W. H. Mason, R. G. Kellock, R. J. Evans, J. T. Houghton, E. J. Spring, B. T. Dowling, S. R. P. Rand,

G. J. R. Coles, *J. T. S. Dennis, C. H. Chapman, P. H. Row, G. J. Rankin, *A. D. Slocombe, G. N. Guyatt, *G. M. Cox, C. M. McKay, K. Chester.

* Supplementary 1st Year Entomology.

Granted Supplementary Examination.—
A. R. Glasson, T. J. McEvoy, D. W. Macaulay, C. D. Nicholson, K. G. Baxter, J. R. Ince.

FIRST YEAR.

Pass.—N. C. Thornton, Jean E. Levick, B. L. Birch, B. R. Ellis, P. M. Home, P. G. Ryan, B. V. Rieker, R. F. Akers, D. W. Norman, K. W. Laurie, M. G. Smith.

Granted Supplementary Examination.—
J. R. Comley, D. K. Lacey, J. M. Down, J. L. Parker, J. D. Graham.

PRIZE LIST

THIRD YEAR.

Presentation Volume to Captain of College
—H. R. Brooke.

Dux of College and Gold Medallist—
M. T. Lacey.

Second Aggregate—W. J. Arnott.

First in Practical Work—J. D. Williams.

Farm Records—D. L. Honybun.

SECOND YEAR.

First in Class—J. B. Stuckey (James Cuming Scholarship).

Second Aggregate—P. W. Webb.

First in Practical Work—C. M. McKay.

FIRST YEAR.

First in Class—N. C. Thornton.

Second Aggregate—Jean E. Levick.

First in Practical Work—P. G. Ryan.

Special Prizes

Soil Conservation Project (Awarded by Dookie and Longerenong Old Collegian's Association)—D. L. Honybun.

Plant Diseases Collection—G. T. Wright.

Botanical Collection—N. W. Sims.

Insect Collection—J. R. Comley.

Best Kept Room—P. G. Ryan.

LONGERENONG COLLEGE

A function similar to that held at Dookie, took place at Longerenong College on 28th January, when the Dux Medal, Certificates of Competency, and other prizes were presented.

Welcoming the new graduates to the ranks of the Old Boys, Mr. T. Liley, President of Dookie and Longerenong Old Collegians' Association, expressed his belief that in the course of their future careers graduates would discover the inestimable benefit their college training had conferred on them. Through the years the college had gained a reputation for the conduct and ability of both undergraduates and graduates, and he felt sure that this reputation would be upheld by those present.

Mr. R. C. Newton, Member of the Agricultural Colleges Advisory Committee, said that as a local resident he had always taken a great interest in college affairs, and now that the Victorian Government had honoured him by appointing him to the Advisory Committee to fill the vacancy caused by the resignation of Mr. W. E. Dahlenberg, he would do all in his power to assist in the advancement of agricultural education in Victoria. He congratulated the Principal and his staff and the students on the successful culmination of the year's work.

The Principal, Mr. I. M. Tulloh, reported that the number of graduates (17) was a record and the standard of work done by the students was high. Forty-six students had been in residence throughout the year. This year 20 Agricultural Science students from the Melbourne University would undertake the second year of their course at Longerenong College. Mr. Tulloh thanked the staff and students for their excellent co-operation throughout the year.

EXAMINATION RESULTS IN ORDER OF MERIT

Dux of College—Gold Medallist—C. N. Forster.

Certificates of Competency.—C. N. Forster, J. M. Ridgway, P. W. Harrison, G. J. Wright, J. M. Mill, G. R. Shady, W. B. Patterson, C. A. May, D. C. Henry, P. J. Abbott, K. M. Barham, G. Sheel, J. A. Walter, S. J. Buchan, J. E. Weideman, E. W. Phillpott, W. H. Barrow.

Deferred.—C. C. Greenwood, F. A. Dwyer, G. R. Morten, R. F. Catron.

Dux of First Year.—R. McL. Bigwood.

FIRST YEAR.—Pass.—R. McL. Bigwood, E. Belcher, F. A. Homburg, T. C. Stannus, J. A. Evans, A. E. Ballard, M. F. O'Connor, S. J. Finn, J. N. Plunkett, D. J. Dowling, A. K. Bodycomb, R. D. V. Hill, D. H. Settle.

Deferred Examinations.—L. B. Farmer, A. P. Gross, R. S. Lawrence, G. P. Evans, H. H. Simpendorfer, I. F. Smith.

Presentation Volume to School Captain.—J. M. Ridgway.

D. C. Phillips Memorial Prize (Influence Sports and Studies).—J. M. Ridgway.

Sports Certificates.—P. J. Abbott, F. A. Dwyer, C. C. Greenwood, P. W. Harrison, C. A. May, J. M. Mill, J. M. Ridgway, G. S. Toulson, J. Webber.

House Cricket.—Bell House.

House Athletics.—Bell House.

House Tennis.—(Not complete).

House Swimming.—(Not complete).

Presentation of Sports Cups.—S. J. Finn, J. M. Ridgway, C. C. Greenwood, G. S. Toulson, F. A. Homburg (Junior Athletic Champion), J. M. Mill (Athletics Champion).

Practical Work (Seniors).—J. M. Ridgway.

Bell Shield (Practical Work).—Bell House.

Practical Work (Juniors).—G. S. Toulson.

Aggregate of Theoretical and Practical Agriculture and Animal Husbandry (Gift of Horsham Agricultural Society).—C. N. Forster.

Dairy Aggregate (Seniors).—J. M. Ridgway.

Dairy Aggregate (Juniors).—R. McL. Bigwood.

Care and Handling of Teams.—J. M. Ridgway.

Farm Blacksmithing.—P. J. Abbott.

Hugh Pierce Memorial Prize (Farm Engineering and Blacksmithing).—Gift of Mr. Henty Sylvester—K. M. Barham.

Herd Testing Class

A class for the instruction of Herd Testers will be conducted by the Department of Agriculture at the School of Primary Agriculture, Burnley, commencing on 5th April, 1948. At the conclusion of the class, an examination for the Herd Testers' Certificate of Competency will be held on the 21st–22nd April, 1948. No charge will be made for tuition, but the class will be limited to persons who intend to take up herd testing work. Instruction will be given in the principles of milk testing; the practice and principles of the Babcock test; rules governing the Association system of testing; herd test recording work and the preparation of herd test returns.

With the considerable expansion of herd testing in Victoria vacancies exist for qualified testers, and persons who are successful at the examination should have no difficulty in finding suitable positions. Further information may be obtained from the Superintendent of Dairying, Department of Agriculture, Melbourne.

PASTURE SEED CERTIFICATION

“Mt. Barker” Mid-season Flowering Subterranean Clover

List of Growers with Areas Approved for 1947-48 Season

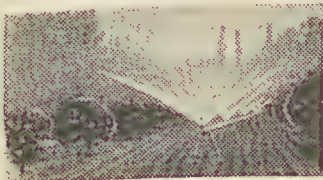
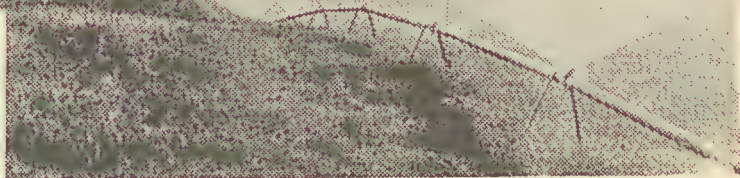
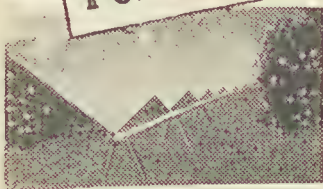
Reg. No.

- M.B.—1. Neagle, A. E., Apsley, P.B., via Narracoorte, S.A.
2. Thomas, C., Apsley.
3. Griffin, W. J., P.B., Apsley.

Reg. No.

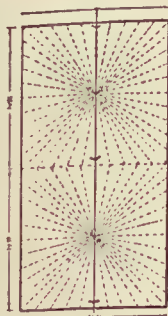
4. McQueen, J., Girgarre.
5. Matheson, J. J., Gnarwarre via Geelong.
6. Honey, W. M., Box 2, Wonthaggi.
7. Lee, W., Lismore.

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IN THE ORCHARD



By G. W. GAYFORD, B.Agr.Sc., Senior Horticultural Instructor

HARVEST TIME

HARVEST time is probably the period of greatest mental strain for the fruitgrower. Having carefully irrigated, cultivated, and sprayed his trees to produce the maximum quantity of high-quality fruit, the orchardist is naturally very anxious to see the fruit in boxes on the way to market or cannery before any wind or hailstorm robs him of his due reward.

Under present conditions of labour shortage, the decision regarding the best time to commence picking is sometimes influenced by factors other than the usual signs of maturity of fruit. However, in order to obtain maximum yield, choicest fruit, and, for apples and pears, maximum life in cool storage, the stage of the fruit when picked is obviously of considerable importance. The following are some of the factors which should be considered before deciding the best time to start picking the crop.

Size of Fruit

With most kinds of fruit the size continues to increase until the fruit is removed from the tree, provided there is an adequate

moisture supply. For this reason then, maximum yields will be obtained from trees on which the fruit is allowed to remain as long as possible.

Firmness of Fruit

With stone fruits the state of firmness of fruit is frequently used as a criterion for deciding the picking period. Dessert peaches for market are at their best when picked "eating ripe" from the tree, but obviously they could not be handled and transported from orchard to retail shop in this condition without considerable loss. Picking is commenced, therefore, when the first few fruits on the tree commence to soften. For market purposes the fruit must be firm when packed. Because peaches ripen rapidly during periods of warm weather, there is usually a tendency to pick the fruit on the firm side of maturity; consequently it is frequently difficult to obtain peaches of good-eating quality in the shops.

Fruit should be picked in such a condition that, when kept at ordinary room temperatures for about four days, the peaches will be "eating ripe". If the ripening

period is much longer than this the quality of the fruit when soft enough to eat is usually poor.

Colour of Fruit

The ground colour of the fruit is probably the most reliable and practical criterion of picking maturity available to the orchardist. The amount of blush or red colour on the skin of the Jonathan apple is not of itself a guide to maturity. When the fruit is ready for picking the colour of the skin of the fruit where no blush has appeared should be changing from green to yellowish green. Apples picked at this stage will keep for the longest period in cool store. Apples which are immature when picked will shrivel and will be of very poor flavour, whereas apples which are stored in an overmature condition will have a short storage life, and the Jonathan variety is susceptible to the skin disorder, Jonathan spot.

Pears for storage should also be picked when the ground colour of the skin changes from dark green to yellowish green. Colour charts showing the correct stage of ground colour for Jonathan apples and Packham pears are available on application to the Department of Agriculture.

Harvest time for canning peaches is also decided by the change of colour from yellowish green to yellow.

Colour of the Seeds

The darkening in colour of apple and pear seeds occurs as the fruit approaches maturity. This characteristic is regarded as too variable to serve as a useful guide to maturity.

Separation of Fruit from the Tree

As the fruit approaches maturity, it becomes more readily detachable from the tree. This is looked upon as an index of maturity, but is also an undesirable characteristic in that the onset of hot weather may cause severe dropping just prior to harvest. It is an unreliable test for apples and pears, and now most growers apply drop-prevention sprays to counter the effect. With almonds, walnuts, and filberts the commencement of dropping of the fruit is used as the indication that the crop is ready for harvest.

WALNUT BLIGHT

The unusually wet season last year resulted in severe infection of walnut blight throughout the State. This is a bacterial disease which causes black angular spots on the leaves and black patches which extend into the centre of the fruit. Fruit infected early in the season usually falls from the tree.

This disease is one of the chief causes of loss to walnut growers in Victoria and is particularly noticeable at the present time. Unfortunately, there is nothing which can be done at this stage to prevent the damage, but sprays with Bordeaux mixture, applied in the spring just before the female flowers open, again after the fruit has set, and a third spray ten days later, will have some controlling effect.

The Bordeaux mixture may be prepared by dissolving 4 oz. copper sulphate in $2\frac{1}{2}$ gallons of water in a non-metallic vessel, mixing 4 oz. slaked lime in another container, and combining these two solutions in a third non-metallic vessel.

In order to reduce the carry over of the disease from one season to the next, all infected fruit and leaves should be collected and burnt.

STANDARD HERD RECORDS

The Standard Herd Records for pure-bred dairy cows for the quarter ended 31st December, 1947, will shortly be available for distribution. Copies may be obtained on application to the Superintendent of Dairying, Department of Agriculture, Melbourne, C.2.

CEREAL INVESTIGATIONS IN THE WIMMERA

The following account of experimental work conducted at the Longerenong Agricultural College was prepared by Mr. B. F. McKeon, B.Agr.Sc., District Agricultural Officer. This article, together with other material published in the February issue of the Journal, has been included in a guide book which is available for general distribution and for the information of visitors to the Station.



Preparing a fallow at Natimuk in the southern Wimmera.

FALLOW CULTIVATION TESTS

Fallow cultivation trials have been conducted since 1927 to furnish information as to the best methods of preparing fallow for wheat growing, and to compare the efficiency of the principal systems of fallowing employed by Wimmera farmers. Twenty quarter-acre plots were devoted to the experiment, and fifteen cultural treatments have been under investigation. Prior to 1940, these tests were conducted on a three-course rotation of fallow-wheat-oats, but,

since that date, the trial has been undertaken on a fallow-wheat rotation. In both rotations the wheat stubble was usually burnt. The summarized results are shown in Table 5 and the detailed results in Table 6 on the following page.

In the fifteen years of test there has been no uniform superiority in yield from either summer or winter fallow, as each type has shown to advantage in different years. Over this period summer fallow has given an average yield of 36.0 bushels per acre, and winter fallow 35.3 bushels per acre. It is probable that increased yields

from summer fallow would be more apparent on land where weeds are more prevalent than on the experimental site.

TABLE 5.—FALLOW CULTIVATION TESTS.

Treatment.	Wheat Yield, Average 15 Years.
	bush./ac.
Summer fallow (average four plots) ..	36·0
Winter fallow (average three plots) ..	35·3
Late fallow (October)	25·4
Sheeped winter fallow (no cultivation, August till autumn)	24·6
Non-fallow—not ploughed till autumn ..	14·9

One of the most interesting features of the tests is the reduced yield resulting from late fallow. Land ploughed in October has yielded 25·4 bushels per acre, a reduction of 9·9 bushels compared with winter fallow.

The tests emphasize the importance of early fallowing in the Wimmera, and demonstrate the advantage gained by completing the fallowing in July–August. A practice recommended is that sufficient area of summer fallow should be prepared to permit an early completion of the fallowing programme.

The advantages of adequate cultivation are also demonstrated, and the results show that the use of sheep alone during the spring and summer months is not sufficient preparation for Wimmera land.

The trial has now been concluded, and a new cultivation trial, conducted on the replicated system, has been established at Longerenong. The main object of this test is to investigate the effect on soil fertility (including such factors as soil structure and liability of the soil to drift) of a number of treatments incorporating the non-burning of stubble and the replacement of part of the normal fallow period by oats for grazing and oats as a green manurial crop. The detailed treatments are set out below. Following these treatments, each plot will be sown to wheat and the yields from each treatment recorded over a number of years.

1. Summer fallow (stubble burnt).
2. Summer fallow (stubble NOT burnt).
3. Winter fallow (stubble NOT burnt).

4. Non-fallow; sheeped as required, cultivated autumn.
5. Stubble NOT burnt; oats sown for grazing—fallowed September.
6. Stubble NOT burnt; oats sown for grazing—cultivated following autumn.
7. Stubble NOT burnt; oats sown (not grazed)—ploughed under September.
8. Stubble NOT burnt; left out and grazed till September—then fallowed.

TABLE 6.—FALLOW CULTIVATION TESTS.

(Detailed Treatments—Average Yield Fifteen Years.)

Treatment.	Wheat Yield, Average 15 Years.
	bus./ac.
<i>Summer fallow—</i>	
March, ploughed 3½ inches, scarified end July 3½ inches (average four plots)* ..	36·0
March, ploughed 5 inches, scarified end July, 3½ inches*	36·1
March, scarified 3½ inches, scarified end July, 3½ inches*	35·7
March, spring-toothed 2 inches, ploughed July, 3½ inches*	36·6
March, ploughed 3½ inches, scarified end July, 3½ inches, worked to 3½-in. mulch	36·5
March, ploughed 5 inches, scarified end July, 3½ inches, worked to 3½-in. mulch	36·5
May, ploughed 3½ inches, scarified end July, 3½ inches*	36·6
<i>Winter fallow—</i>	
July, ploughed 3½ inches, scarified August, 2½ inches (average three plots)* ..	35·3
July, ploughed 3½ inches, scarified August, 3½ inches, worked to 3½-in. mulch ..	35·3
July, ploughed 5 inches, scarified August, 3½ inches, worked to 3½-in. mulch ..	35·5
July, ploughed 3½ inches, scarified August, 2½ inches,* knife-barred dry in January	35·4
July, ploughed 3½ inches, scarified August, 2½ inches,* disked deeply dry in January	34·6
<i>Late fallow, &c.—</i>	
October, ploughed 3½ inches, scarified November, 2½ inches*	25·4
Non-fallow, cultivated, or ploughed after 1st April	14·9
July, ploughed 3½ inches, scarified August, 2½ inches, then sheeped till autumn, cultivated April	24·6

* These plots subsequently received standard treatment, i.e., scarified 2½ inches deep to kill weeds and form seed-beds in August and September; sheeped during spring and spring-toothed or harrowed as required to maintain 2½-in. mulch and level consolidated seed-bed. Scarified and harrowed in late autumn before sowing.

Seed—Ghurka sown at 75 lb. per acre. Superphosphate, 1 cwt. per acre.

SOIL MOISTURE AND PLANT FOOD STUDIES IN FALLOWS

In conjunction with the cultivation tests where the yields resulting from various cultural practices are compared, systematic studies have been made to determine the extent of the accumulation of soil moisture and plant food. Particular attention has been given to soil moisture, nitrogen, phosphoric acid, and potash in land prepared by various methods. Bacteriological work, with special reference to the development of available nitrogen, has also been carried out.

The work has emphasized the importance of soil moisture conservation by fallowing, and of weed control during the fallow period. The studies have shown that weed growth has a very significant effect in depleting both soil moisture and available nitrogen in the fallow.

WHEAT MANURIAL TRIALS

(a) Trial on Permanent Site

The object of this experiment is to demonstrate the effects of various fertilizers on the yield of wheat. The trials, which have been in progress for 35 years, are

TABLE 7.—PERMANENT WHEAT MANURIAL TRIALS.

*Average Yields, 33 Years, 1912-40, 1943-46.

Plot Number.	Manurial Treatment per Acre.	Average Yield.
		bus./ac.
1	No manure	33.4
2	Super. $\frac{1}{2}$ cwt.	37.2
3	Super. 1 cwt.	38.8
4	Super. 2 cwt.	39.5
5	Super. 1 cwt. + lime 5 cwt. ..	38.0
6	Super. 1 cwt. + lime 10 cwt. ..	37.5
7	Super. 1 cwt. + nitrate of soda 40 lb. applied with seed ..	37.6
8	No manure	36.1
9	Basic slag, 1 cwt.	34.5
10	Super. 1 cwt.	37.5
11	Super. 1 cwt. + nitrate of soda, 40 lb. + potassium sulphate, 40 lb. ..	37.5
12	Super. $\frac{1}{2}$ cwt. + basic slag, $\frac{1}{2}$ cwt. ..	36.6
13	Super. 1 cwt. + nitrate of soda, 40 lb. in spring	37.6
14	Farmyard manure, 10 tons	34.1
15	No manure	33.6

* In 1941 and 1942, a residual test was conducted on the sites.

located on black land on two permanent sites conducted on a fallow-wheat rotation. Since 1935, the plots have been sown with Ghurka. The quantities of the various manures applied each year, together with the average yields obtained since 1912, are shown in Table 7.

From this table, it will be seen that the best results have been obtained from the use of superphosphate alone, and that the use of lime or nitrogenous fertilizers with wheat on fallow under Longerenong conditions is not necessary.

(b) Replicated Trial on Changing Sites

In 1933, a replicated manurial trial was commenced in which the plots have been located each year on changing sites in fields cropped on a fallow-wheat-oats rotation. The average yields in this trial are shown in Table 8.

TABLE 8.—REPLICATED WHEAT MANURIAL TRIAL.

(Yields in bushels per acre.)

Treatment.	Average 7 Years, 1933-39.	Average 12 Years, 1933-39, 1942-46.
No manure	37.6	33.5
Super. $\frac{1}{2}$ cwt./ac.	39.1	34.6
Super. 1 cwt./ac.	40.2	35.1
Super. $1\frac{1}{2}$ cwt./ac.	40.8	..
Super. 2 cwt./ac.	40.3	..

NOTE.—The above table is on the basis of 22 per cent. superphosphate.

The increased yields from the various applications of superphosphate in the above test are shown in the following table, together with the net monetary return obtainable in each case, with wheat valued at 5s. 6d. per bushel on the farm, and superphosphate (22 per cent. basis) at £6 15s. per ton delivered on the farm.

Table 9 is a guide to the most economic dressing to use in general practice on land similar to that of Longerenong. The results indicate that at the prices shown, an application equivalent to approximately 1 cwt. per acre of 22 per cent. superphosphate is the most payable one to apply.



Effect of zinc sulphate on a wheat crop in the Western Wimmera. Left, super. only. Right, super. plus zinc sulphate.

TABLE 9.—EXTRA RETURN PER ACRE DUE TO SUPERPHOSPHATE.

	Average Yield 7 Years, 1933-39.	Increase Due to Super.	Value of Increase at 5s. 6d. per Bus.	Cost of Super. at £6 15s. per Ton (22 per cent. Basis).	Extra Return per Acre Due to the Super.
	bus./ac.	bus./ac.	s. d.	s. d.	s. d.
No manure..	37.6	..	..	..	..
Super. $\frac{1}{2}$					
cwt./ac. ..	39.1	1.5	8 3	3 5	4 10
Super. 1					
cwt./ac. ..	40.2	2.6	14 4	6 9	7 7
Super. $1\frac{1}{2}$					
cwt./ac. ..	40.8	3.2	17 7	10 2	7 5
Super. 2					
cwt./ac. ..	40.3	2.7	14 10	13 6	1 4

ZINC SULPHATE

Following the discovery in the Nhill district by the Department of Agriculture in 1936 of the possibilities of zinc sulphate applied with superphosphate, in increasing the yield of wheat crops in the Wimmera, extensive experiments with this mineral have since been undertaken at many centres. The tests include varying quantities of zinc sulphate applied with and without superphosphate, and miscellaneous investigations on aspects such as residual effect, forms of zinc, &c.

The results to date of the main trials on land not previously treated with zinc at Longerenong, Salisbury (near Nhill), and Kaniva are summarized in Table 10, and it will be noted that at each centre an increase in the wheat yield, due to the zinc sulphate, has been obtained, the response being most marked at Kaniva.

Regarding the Wimmera experiments in general, the response from the zinc sulphate has been more marked in the western and central portions of the district than in the eastern zone, and, on the whole, the mineral has been more beneficial on black land. On the red and loamy soils the results have been variable, definite responses being obtained in some cases, while in others the material had no effect.

The mineral costs approximately 2d. per lb., and, as the requisite dressing—5 to 10 lb. per acre—is comparatively cheap, only a small increase in the wheat yield is required to warrant its use.

Reviewing all the evidence to date, the tests demonstrate that on many farms in the Wimmera, particularly on the black soils in the western section of the district, the use of zinc sulphate is an economic means of increasing, to a certain extent, the wheat yields on fallowed land not previously treated with the mineral.

TABLE 10.—ZINC SULPHATE TRIALS WITH WHEAT ON BLACK SOIL.

(Average Yields in bus./ac.)

Treatment per Acre.	Longerenong.		Salisbury.		Kaniva.	
	9 Years, 1938-46.	Increase Due to Zinc.	3 Years, 1938-40.	Increase Due to Zinc.	4 Years, 1939-41, 1945.	Increase Due to Zinc.
Super. 1 cwt. ..	29.8	..	25.6	..	32.8	..
Super. 1 cwt. and zinc 20 lb...	..	..	27.3	1.7	..	..
Super. 1 cwt. and zinc 10 lb...	32.0	2.2	27.1	1.5	37.8	5.0
Super. 1 cwt. and zinc 5 lb. ..	..	..	27.2	1.6	37.0	4.2

Wheat growers desirous of testing the mineral on their own paddocks are advised to apply it at the rate of 5 to 10 lb. per acre, mixed with the superphosphate. The mixing can be done any time before cropping, as experience has indicated that there is little risk of the mixture losing its free-running texture, **provided the materials are reasonably dry when mixed and kept in that condition.** It is very advisable, on land where the mineral is being tried, for farmers to leave some strips sown without zinc so that comparisons can be made between the treated and untreated crop.

Residual Value of Zinc Sulphate

An important aspect of the response of wheat crops to zinc is the extent to which an application of the mineral to one crop will benefit succeeding crops on that land. In other words, how often is it necessary to apply zinc to wheat under Wimmera conditions?

TABLE 11.—RESIDUAL VALUE OF ZINC SULPHATE.

(Wheat Yields in bush./ac.)

Treatment per Acre (Land Previously Treated with Zinc).	Salisbury, Average 2 Years, 1940-41.	Kaniva, Average 4 Years, 1942-44, 1946.
Super. 1 cwt.	29.6	42.7
Super. 1 cwt. and zinc 20 lb...	30.2	..
Super. 1 cwt. and zinc 10 lb...	30.0	44.4
Super. 1 cwt. and zinc 5 lb...	29.8	44.6

In tests at Salisbury and Kaniva, using superphosphate alone and in combination with varying amounts of zinc sulphate on land treated with approximately 7 lb. per

acre of the mineral with the previous wheat crop, comparatively little response to the various quantities of zinc has been obtained. The results of these trials are shown in Table 11.

The information obtained from these tests to date indicates that it is not necessary to apply zinc with every wheat crop, and that little, if any, response to fresh applications of zinc sulphate may be expected on land to which at least 7 lb. per acre of zinc sulphate was applied with the previous wheat crop. These trials will be continued over a further period of years in order that further information may be obtained as to how frequently it is necessary to apply zinc.

Trials with Zinc on Other Crops

With oats, subterranean clover, phalaris, and flax, when sown on fallow, the effect of zinc sulphate, applied in addition to superphosphate, has been quite pronounced—increased height, growth, and depth of colour being obtained.

The discovery that clovers, and possibly other pasture plants, will respond to applications of zinc may be of great importance in the development of pastures in the Wimmera.

With stubble-sown oats no conclusive results, as yet, have been obtained at either Longerenong or Salisbury. In some instances a residual effect from the mineral applied to the wheat crop in the previous year has been observed.

MINERAL DEFICIENCY TRIALS

Wheat and Oats

In addition to the minerals such as phosphate, nitrate, potash, and calcium, which are recognized as being essential for plant

growth, it has been established that certain "trace" elements, so called because they are required in minute quantities only, are also necessary for optimum plant development. Six of these "trace" elements or minerals have been under test, with wheat and oats on fallow, to investigate whether any of them are deficient in Longerenong soils. Each mineral was applied in addition to superphosphate, and a mineral mixture comprising equal parts of zinc and manganese sulphates was applied with both superphosphate and super. and ammonia 1—1 mixture.

The following treatments, in addition to zinc sulphate, have been under investigation:—

- Super. 1 cwt. + Magnesium sulphate, 56 lb./ac.;
- Super. 1 cwt. + Manganese sulphate, 10 lb. and 30 lb./ac.;
- Super. 1 cwt. + Iron sulphate, 56 lb./ac.;
- Super. 1 cwt. + Copper sulphate, 10 lb./ac.;
- Super. 1 cwt. + Borax, 5 lb./ac.;
- Super. 1 cwt. + Mineral mixture, 20 lb./ac.;
- Super. 1 cwt. + Ammon. sulph. 1 cwt. + Mineral mixture, 20 lb./ac.;
- Superphosphate only (1 cwt. per acre).

In these trials, certain of the minerals, particularly manganese, have given a small response in some seasons, but, in general, there has been little evidence of an improvement in growth or yield of wheat and oats at Longerenong by the application of these minerals. Care should be exercised in the use of these minor elements on farm areas, as their indiscriminate application may prove detrimental both to the crop and the soil to which they are applied.

PICKLING TESTS

Wheat and Barley

Experiments on the efficiency of various pickling treatments in the control of *ball smut* disease in wheat were conducted at Longerenong from 1925 to 1942.

Yield Trials.—In this section the effect of different pickling methods on the subsequent wheat yield is ascertained. The early trials were with dry copper carbonate and the wet treatments, formalin and bluestone. Conclusive evidence from nine years' tests (1925–33) showed the superiority of copper carbonate compared with the wet methods, a higher wheat yield, and better germination being obtained with the dry powder.

In more recent years the yield trials have included the new mercurial pickling powders tested against copper carbonate. There has been no significant difference in the yield of wheat pickled with the respective powders in these trials.

Effectiveness of Wheat Pickling Powders.—Various brands and types of commercial pickling powders have been tested to compare their efficacy in controlling ball smut of wheat. In this series of plots the seed (Dollar wheat) was artificially infected with spores of ball smut and tests were made using each powder. The results showed there are differences in the effectiveness of the powders tested; and the better brands of mercurial compounds give the highest degree of control.

Barley Pickling Trials.—These tests have shown that the mercurial pickling compounds are much superior to copper carbonate in controlling *covered smut* of barley.

WHEAT PICKLING—GENERAL COMMENTS

Experience has shown that wheat growers should always carefully pickle their seed to control ball smut, otherwise losses in yield from this disease may be very serious. The sowing of wheat which has not been pickled is a risky and unwise practice.

For many years the dry method of pickling, using copper carbonate, has been recommended by the Department of Agriculture, in preference to the wet treatments—formalin and bluestone. An important point in dry pickling is that the mixing of the grain and powder should be very thoroughly done, so that each grain is thoroughly dusted. With copper carbonate, 1½ oz. per bushel of wheat is the dressing advocated, and this quantity, if carefully mixed, should give satisfactory control.

Regarding the new mercurial compounds, Departmental tests have shown that the best brands of these powders are very efficient fungicides, and, when thoroughly mixed, 1 oz. per bushel of wheat is sufficient to use for complete control of ball smut. Although the mercury compounds are more poisonous than copper carbonate, it has been found in practice that, as a general rule, there is little danger in using them, as their dust does not rise so readily as the copper powders. For this reason grain treated with mercurial pickle is usually more pleasant to



Trials with various pickling compounds at Longerenong.

work with; also, grain so treated runs more freely through the combine or drill than seed pickled with copper powder. Further, the mercurial compounds are the most efficient pickles to use for the control of covered smut of barley and smut diseases in oats.

The mercurial powders, however, are more expensive than copper carbonate, but their advantages (as indicated above) somewhat offset the higher cost.

HAY TRIALS

Oats and Wheat

In these experiments the hay yields of a number of oat and wheat varieties have been compared; in the early period of the test the trials were conducted on stubble land, but, in recent years, the experiments have been on fallow.

The trials were replicated and the seeding rate of the oats was 60 lb. and wheat 75 lb. per acre. The dressing of super. was 40 lb. and 1 cwt. per acre, on stubble and fallow respectively. The results of these trials are set out in Table 12.

TABLE 12.—HAY TRIALS—OATS AND WHEAT.
Yields in cwt./ac.

Variety.	On Stubble.		On Fallow.	
	Average 6 Years, 1936-41.	Average 3 Years, 1939-41.	Average 8 Years, 1939-46.	Average 4 Years 1939-42.
<i>Oats—</i>				
Algeribee ..	21.6	33.4	41.0	53.0
Dawn ..	21.0	32.1	40.7	54.6
Algerian ..	20.7	32.5	..	50.2
Orient ..	..	29.1	39.6	51.2
Mulga ..	21.6	33.8	39.5	48.6
Fulghum ..	..	32.9	..	..
Lachlan ..	..	31.9	..	..
<i>Wheat—</i>				
Magnet ...	..	..	50.7	68.7
Baldmin ..	..	..	..	66.6
Bencubbin ..	..	35.6	..	..

Of the varieties under test, Algeribee, Dawn, and Algerian have been the most prominent of the mid-season types, while the early-maturing oats, Mulga and Orient have also returned good yields.

Algeribee

Produced by the Department of Agriculture, Algeribee is an improved selection of Algerian, and bears a general resemblance to the parent variety, but comes away

more rapidly in early spring. In many tests throughout the State Algeribee has shown higher yielding ability for both hay and grain than Algerian.

Dawn

A mid-season oat, Dawn matures a week or so earlier than Algerian. It has given very good hay yields in most districts, and has proved a very suitable variety for grazing purposes. Generally, Dawn gives a lower grain yield than Algerian.

Fulghum

Another mid-season type, Fulghum is a fairly good hay oat, and has shown itself an excellent variety for grazing—also, it recovers well after feeding off.

Mulga

This variety is a useful oat under dry conditions and for quick early feed.

Orient

A new variety recently produced by the Department of Agriculture, is a cross between Palestine and Dawn. Orient is a short-strawed variety, and has proved particularly suitable for winter grazing and capable of producing a good grain yield after the sheep have been taken off in early spring. Although Orient is especially suited to Mallee conditions, like Mulga, it may prove a useful variety in dry seasons and where early grazing is required.

Summing up the question of oat varieties for the Wimmera, the standard variety, Algeribee, an improvement on Algerian, is regarded as the best oat for grain, while the mid-season varieties, Dawn and Fulghum, and the earlier types, Mulga and Orient, give more early feed.

The average yields in the wheaten hay section have been heavier than those obtained from the oat varieties.

In the oat variety trial being conducted at Longerengong this year, the following varieties, crossbreds, and selections are included:—

Algeribee, Algerian, Dawn, Mulga, Orient, Dale, Algerian Selection 277-2-1, Algerian Selection 133-1-1.

OAT MANURIAL TRIALS

On Stubble

Oat manurial trials were commenced in 1928 to determine the effect of various manures applied to oats sown on stubble ground. As shown in the Table 13, in the six-year period 1928-33, no significant increase in *grain* yield was obtained with either superphosphate or sulphate of ammonia applied separately or in combination.

The experiment was re-established in 1936, and conducted as a replicated trial until 1941, with six manurial treatments of superphosphate and super. and ammonia mixtures, compared with no-manure—the oats being cut for hay.

Under the drought conditions of 1938 and 1940, the plots failed to reach maturity, and in 1939, owing to flooding, the results were unreliable. The average yields in the three years, 1936-38, showed there was practically no increase in yield from either superphosphate or the lighter dressings of super. and ammonia mixture—a result supporting that obtained in the earlier trials. With the heavier applications of the mixed fertilizer a greater response occurred. The extra hay yield, however, was insufficient for the treatment to be a payable proposition. The tests indicate that the use in the Wimmera, of super. and ammonia mixture for stubble-sown oats is unlikely to be profitable.

TABLE 13.—OAT MANURIAL TRIALS—ON STUBBLE.

Grain Tests. (Manure Applied per Acre).				Average Yield 6 Years, 1928-33.
No manure ..	..	..	..	bus./ac. 27.0
Super., $\frac{1}{2}$ cwt.	..	..	..	27.8
Super., 1 cwt.	..	..	..	26.1
Ammon. Sulph., $\frac{1}{2}$ cwt.	..	..	..	27.2
Super. and Ammonia (1-1), 1 cwt.	..	..	..	27.2
Hay Tests.				Average Yield 3 Years, 1936-38.
No manure ..	..	..	..	cwt./ac. 9.9
Super., 40 lb.	..	..	..	10.0
Super., 80 lb.	..	..	..	10.2
Super. and Ammonia (1-1), 40 lb.	..	..	..	10.6
Super. and Ammonia (1-1), 80 lb.	..	..	..	11.0
Super. and Ammonia (1-1), 120 lb.	..	..	..	12.8
Super. and Ammonia (1-2), 120 lb.	..	..	..	13.4



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Barley Trials

In the barley variety trial at Longerenong, a number of six-row feed types and two-row malting barleys have been under trial since 1939. The plots were sown on fallow and the average results to date are shown in Table 14. In 1942, the plots were severely damaged by storms and no yields were obtained, and, in 1944, the plots failed during the severe drought.

TABLE 14.—BARLEY VARIETY TRIAL.
Yields in bush./ac.

Variety.	Average 7 Years, 1939-41, 1943-46.	Average 6 Years, 1939-41, 1943-45.
<i>Feed Types—6-rowed—</i>		
Cape	43.5	40.9
Atlas	..	39.9
<i>Malting Types—2-rowed—</i>		
Research	40.5	36.2
Prior	37.9	34.0

Cape has returned the highest average yield over the period of the test, while the new malting variety, Research, which was bred by the Department of Agriculture from a cross between Prior and Plumage Archer, has given encouraging results.

The malting types, Research and Prior, produce grain of higher malting quality and therefore higher value than do the feed types such as Cape.

Other barley investigations which were initiated just before the war, and which were subsequently suspended, included a rate of seeding test on stubble land with three rates of sowing, namely, 20, 40, and 60 lb. per acre. Also, in order to test the effect of a nitrogenous manure on stubble-sown barley under Longerenong conditions, plots sown with 40 lb. of seed and 80 lb. of super. and ammonia 1-1 mixture per acre were included in this trial. It is hoped to re-establish these investigations as soon as practicable.

CEREAL BREEDING AND SEED PRODUCTION

For many years all stages of wheat breeding and improvement work were undertaken at the experimental station at Longerenong, and among the most successful wheats evolved at this centre were the varieties Wannon and Nizam. Several of the more recent crossbreds developed at Longerenong have also shown distinct promise, and are at present under intensive trial in various districts. The practice now adopted by the Department is to carry out the crossing and first generation stages of cereal breeding at the State Research Farm, Werribee. The second generation crossbreds are then sown in stud rows at the various experimental stations, where selections of those plants exhibiting desirable characters are made. After a number of years of further selection, only a few of the more



A heavy yielding crop of Pinnacle wheat at Longerenong.

promising, true-breeding strains of the original population are retained. These are then grown in seed multiplication plots, and pass to the larger field plots for accurate testing to determine their yielding capacity and general suitability.

At Longereng this year, the cereal breeding and development section comprises the following:—

Stud Rows—Approximately 400 single rows of wheat, oat, and barley varieties;

Seed Production Plots—44 plots of wheat and oats for seed supplies.

In the seed-production section a number of wheat plots is sown each year with specially selected seed, which is kept pure and true to type. By this means a continuous supply of "fresh" seed of the most improved strain available is maintained. The produce from these plots is used to sow the College farm paddocks which, in their turn, provide the seed wheat which is distributed in large quantities to farmers throughout the Wimmera and other districts.

CROP ROTATION TRIALS

The crop rotation investigations at Longereng comprise two main sections:—

(a) Permanent trial;

(b) Supplementary trial (replicated).

(a) Permanent Rotation Trial

This section was commenced in 1918 with the object of determining how the yield of wheat is affected when grown under various cropping systems, and also to furnish information on the problem of maintaining soil fertility in the Wimmera. The yields of seven rotation systems which have been conducted during the period 1918–46 are shown in Table 15 below:—

TABLE 15.—PERMANENT ROTATION TRIAL—YIELD OF WHEAT, OATS, BARLEY 1918–46.

Crop Rotation.	Average Yields Bus./ac.		
	Wheat, 29 Years.	Oats, 29 Years.	Barley, 27 Years.
Wheat continuously ..	9·7	..	..
Wheat after fallow ..	31·7	..	..
Wheat-pasture-fallow ..	34·2	..	..
Wheat-oats-fallow ..	34·2	18·5	..
Wheat-oats-pasture-fallow ..	34·4	18·3	..
Wheat-oats-peas ..	21·8	16·6	..
Wheat-barley-peas ..	21·6	..	22·3

In 1934, the Permanent Rotation Trials were extended to include the rotation *wheat-stubble wheat-fallow*, and, in 1938, two new systems were introduced, namely, *wheat-barley-fallow* and *wheat-oats grazed, spring fallow*, together with a check rotation of *wheat-fallow*.

Some of the main features of the results of the experiments to date are as follow. In regard to the wheat crop it is notable that the highest average yields have invariably been obtained when the crop is preceded by bare fallow, demonstrating that in the Wimmera, the growing of wheat on fallow is essential for maximum yields. Comparing the rotations *wheat-oats-fallow* (34·2) and *wheat-oats-peas* (21·8) it will be seen that the effect of growing peas in place of the bare fallow was to lower the subsequent wheat yield by 12·4 bush./ac.

In the rotation *wheat-stubble wheat-fallow* the yields obtained (average eleven years) were:—wheat on fallow 30·7, stubble-wheat 13·8 bush./ac.

The question as to which is the most suitable system for the individual farmer to use depends on economic and other specific factors associated with the farm. The results of these trials, however, demonstrate how crop yields are likely to be affected under certain rotations, and, in that connexion, furnish valuable evidence for the guidance of Wimmera wheat growers.

A detailed examination of the seasonal yields and other factors is necessary to determine the influence of the cropping systems on the trend of soil fertility. Such a study of the results over 21 years has been made, and shows that, despite the increased yielding ability from new varieties, the wheat yields in the intensive cropping rotations of *wheat-fallow* and *wheat-oats-fallow* have just maintained themselves.

The investigation demonstrates the high fertility of Wimmera black soil which continues to produce heavily, provided that the wheat is sown on well-prepared fallow. On less fertile soils, it has been found necessary to occasionally spell the land under pasture in order to maintain fertility. These experiments do not demonstrate the extent to which the fertility of black Wimmera land may be increased by spelling in pasture, and this aspect is receiving further study in the supplementary rotation trial.

**(b) Supplementary Rotation Trial
(replicated)**

In 1946, a further series of rotation tests was commenced at Longerenong, in order to study the influence on soil fertility of (a) burning stubble; (b) ploughing-in stubble; and (c) the inclusion of a two-year period under pasture.

The following three rotations are included:—

(a) Fallow-wheat. (stubble burnt);

(b) Fallow-wheat (stubble not burnt);

(c) Fallow-wheat-pasture-pasture.

The wheat plots were sown with Quadrat with the equivalent of 1 cwt./ac. of 22 per cent. superphosphate, and the pasture plots were sown with a mixture of Wimmera rye grass and barrel clover. The experiment is replicated three times. Several years must elapse before conclusions can be drawn from this experiment.

TABLE 16.—SUMMARY OF WHEAT YIELDS, RAINFALL, AND SOWING DETAILS, ON THE LONGERENONG COLLEGE FARM FOR THE YEARS 1914-46.

Year.	Area Harvested.	Time of Sowing.	Seed Sown.	Super. Used.	Average Yield.	Rainfall (in Inches).	
						Total.	1st June to 30th November.
	acres.		lb./ac.	lb./ac.	bush. per acre.		
1914	100	14th May to 30th June	60 to 63	70	6	12.19	4½
1915	274	20th May to 31st July..	50, 60, 90	70	28	16.55	13
1916	361	2nd June to 18th August	75 to 90	112	34	21.00	17½
1917	305	23rd May to 30th June	60 to 90	100	39½	16.79	10½
1918	342	5th May to 17th July..	74 to 84	84 to 112	36	14.75	8
1919	242	26th May to 17th July	75 to 85	110 to 112	27	11.48	4¾
1920	266	20th May to 14th July	80 to 90	90 to 112	38	15.09	11
1921	320	4th June to 8th July..	85 to 90	112	42	17.66	8½
1922	383	10th June to 20th July	85 to 90	112	30	16.28	9½
1923	371	11th June to 10th July	85 to 90	140	47½	15.60	11
1924	349	14th June to 19th July	85 to 90	132 to 180	41	18.10	12¾
1925	444	24th June to 10th July	85 to 90	150	36	11.28	6½
1926	420	3rd June to 2nd July..	84	140	39½	14.92	8¾
1927	339	21st June to 12th July	84	150	24½	10.18	6½
1928	441	14th June to 5th July	80 to 84	150	17½	16.11	7½
1929	479	11th June to 5th July..	80 to 84	150	17½	13.74	5¾
1930	442	7th July to 22nd July	82	150	26	17.43	9½
1931	539	27th May to 15th July	75	140	35½	16.33	9½
1932	517	7th June to 2nd July..	75	140	45	15.73	7½
1933	423	22nd May to 7th June	78 to 84	140	38	19.05	8¾
1934	637	26th June to 19th July	80 to 82	140	37½	15.33	12¾
1935	395	17th June to 1st July..	79 to 82	140	39	14.61	9¾
1936	435	16th June to 2nd July	80 to 84	140	41	20.29	10¾
1937	434	28th June to 16th July	77 to 80	140	44½	16.94	7½
1938	421	8th June to 6th July..	80	140	6½	9.25	5¾
1939	408	8th June to 4th July..	80 to 84	151	39½	18.96	10¾
1940	423	11th June to 3rd July..	78 to 82	143	26	10.16	5
1941	433	14th June to 12th July	85	147	29	17.76	9½
1942	356	5th June to 17th July..	85	115	39½	22.27	13½
1943	360	1st July to 18th July..	85	76 (18%)	27	11.78	8
1944	306	10th July to 22nd July	80	55 (18%)	4½	8.79	3½
1945	367	2nd July to 20th July..	82	75 (18%)	22½	15.95	8¾
1946	380	29th May to 16th July	78 to 83	142 (18%)	44½	17.15	7½

TUBERCLE-FREE HERDS

ACCREDITED TUBERCLE-FREE HERDS

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Aboriginal Station ..	Lake Tyers ..	86	Longerenong Agr. College	Dooen ..	39
Ampt, E. W. ..	Gymbowen ..	12	Maloney, P. J. ..	Tongala ..	66
Ampt, N. C. ..	Gymbowen ..	21	Mavery, A. H. ..	Mitre ..	11
Ballarat Orphanage ..	Ballarat ..	139	Middleton, J. A. ..	Labertouche ..	80
Banyule Stud Pty. Ltd. ..	Wangaratta ..	55	Moore, J., and Co. ..	Yarram ..	88
Beggs, A. R. ..	Beaufort ..	131	Murray, M. G. ..	Lima ..	19
Black, I. S., Estate of ..	Mount Noorat ..	62	McIntosh, J. ..	Merrigum ..	40
Black, I. S., Estate of ..	Horsham ..	16	McKenzie, A. E. ..	Kerang ..	54
Bott, J. ..	Yarrowonga ..	70	McKenzie, Mrs. E. J. ..	Woodford ..	81
Candler, G. E. ..	Hamilton ..	23	McKenzie, H. P. ..	Trawalla ..	15
Carne, W. J. ..	Pakenham Upper ..	30	McNabb, G. A., and Son	Irrewillipe East ..	196
Clark, W. J. ..	Monomeith ..	148	Nancarrow Bros. ..	Kerang ..	56
Cowan, G. L. S. ..	Bacchus Marsh ..	59	Newton, J. M., and Sons ..	Whorouly ..	110
Cox, F. G. ..	"Birradale," Sth. Lyndhurst	47	Nicholas, M. A. ..	Sherbrooke ..	78
Cribbes, T. ..	Wangaratta ..	40	Noonan, Mrs. S. A. ..	Benalla ..	68
Deering, J. T. ..	South Wangaratta ..	79	Northcote Children's Farm	Bacchus Marsh ..	83
Dookie Agricultural College	Dookie ..	117	Onley, W. H. ..	"Glenholme," Caldermeade	62
(Ayrshire Herd)			Parker, Mrs. L. M. ..	Tallarook ..	67
Dookie Agricultural College	Dookie ..	38	Payne, A. E. T. ..	"Yarra View," Lilydale	71
(Hereford Herd)			Payne, T. E. N. ..	"Woodburn," Kilmore ..	76
Everist, F. R. ..	Tyabb ..	12	Poole, M. A. and D. ..	Caldermeade ..	161
Foletta, G. G., and Son ..	Buxton ..	121	Poole, M. A. and D. ..	Yannathan ..	118
Geelong Grammar School	Corio ..	81	Potter, W. J. ..	Longwarry North ..	118
Gilbert, J. A. & R. D. ..	"Brockelbank," Yinnar	108	Price, L. E. ..	Booroopki ..	39
	South ..		Read, exors., estate I. D.	Springhurst ..	99
Gleeson, P. J. and Son ..	Tynong ..	261	Reed, Mrs. B., Estate of	Bundoora ..	94
Gorman, A. W. ..	"Cathcart," Alexandra ..	57	Rix, A. A. ..	Officer ..	79
Griffiths, J. G. ..	Benalla ..	96	Roe, Thomas H. P. ..	Cobram ..	15
Gross, Mrs. G. F. ..	Horsham ..	28	Sanderson, R. F. ..	"Pleasant Hill," Kyneton	75
Hamilton, A. ..	Flinders ..	69	School of Horticulture ..	Burnley ..	9
Henry, J. A. ..	Merrivale ..	39	Scott, F. E. Selwyn ..	Scotsburn ..	76
Howlett, Mrs. G., and	Lang Lang ..	70	State Experiment Farm ..	Rutherglen ..	49
Miss E. Samuel			State Research Farm ..	Werribee ..	203
Jakobi, L. W. ..	"Granda," Yannathan ..	89	Stephens, Dr. F. ..	Vermont ..	40
Johnson, F. G. ..	Horsham ..	21	St. Joseph's Home ..	Sebastopol ..	13
Judd, Mrs. D. R. ..	Broughton ..	22	Syme, David ..	Woori Yallock ..	80
Keele, H. A. ..	Bamawm ..	111	Thomas and Taylor Pty.	Hamilton ..	26
Kemp, E. J. ..	Horsham ..	16	Ltd.		
KilmanyParkHomeforBoys	Kilmany ..	99	Tucker, E. G. ..	Horsham ..	23
Kingsley-Newell, F. J. ..	Shoreham ..	60	Vagg, T. R. ..	Officedale ..	56
La Fontaine, G. ..	Mitta Mitta ..	61	Vagg, F. G. ..	Leongatha ..	57
Lawrence, P. H. ..	"Rainga," Tarrawarra ..	82	Warnock, J. A. ..	Lima South ..	77
Lawton, W. ..	Frankston ..	56	Waterhouse and Son ..	Pakenham ..	66
Light, D. T. ..	Noradjuha ..	12	Williamson Bros. ..	Carisbrook ..	119

In addition to the above the following is a list of herds in their respective districts which have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but, inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the Accreditation Scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

District.	Herds.	Cattle.	District.	Herds.	Cattle.
Bairnsdale ..	4	109	Morwell ..	3	270
Ballarat ..	116	2,855	Orbost ..	1	99
Benalla ..	43	298	Rutherglen ..	20	296
Bendigo ..	65	1,598	Sale ..	5	341
Broadmeadows ..	47	1,969	Traralgon ..	4	218
Colac ..	5	127	Wangaratta ..	45	438
Doncaster ..	18	731	Warnambool ..	6	323
Geelong ..	132	4,105	Whittlesea ..	114	5,130
Hamilton ..	2	94	Yallourn ..	4	269
Heidelberg ..	21	682	Yarragon ..	34	1,616
Horsham ..	9	468	Yea ..	30	82

There are also 339 herds in which 13,506 head of cattle have passed one test and may be considered, therefore, to be in process of becoming tubercle-free herds.

THE VEGETABLE GARDEN

By GEORGE HYAM, Horticultural Supervisor

BROAD BEANS

ALTHOUGH broad beans can be planted throughout March, April, and May, and again from July to August, an early March sowing will usually give some pickings during the winter months, followed by a full flush in early spring. Later plantings will crop in spring. Apart from their use as green seed, freshly-picked, flat, immature pods can be cut up and used in the same way as the pods of French beans, and their flavour is more attractive than beans brought down from the northern States in winter, provided they are picked just before cooking, and at the right stage.

Apart from their culinary use, broad beans are a valuable crop in the garden rotation. They help fix nitrogen in the soil and their heavy tops form excellent humus material when dug in or composted down. Broad beans do best in a well-limed soil, and, if lime has not been applied before, it is advisable—though not so effective—to apply lime just before sowing rather than use none. In most soils, superphosphate is the best fertilizer, used at the rate of 1 or 2 oz. to each 6 feet of row, applied in bands 2 inches away from the seed and about 2 inches deep.

Sow in double rows 12 inches apart, placing each seed 9 inches apart and 3 inches deep. Dusting the seed prior to planting with the special legume dust, tetroc, is recommended as a prevention of any possible carry-over of fungous disease on the seed, and planting in a sunny situation is necessary to avoid rust and mildew. An occasional fungicidal dusting or spraying of the growing plants as a preventative against disease is also desirable.

The dwarf variety, Dwarf Prolific, is best for the smaller garden. Where room permits, the taller-growing Leviathan Long-pod or Broad Windsor are good varieties, but, on account of their height, care should



Dwarf prolific variety of broad bean.

be taken to plant them where they will not shade other winter crops. Running the rows north and south will minimize this disadvantage. During growth, the tips, which can be cooked like spinach, should be nipped out to make the plants stool, and some support is necessary to avoid the tall stems being damaged by wind.

HARVESTING VINE VEGETABLES

March-early April is the time when all pumpkins, squash, and marrows wanted for winter storage should be gathered. Although the keeping qualities of varieties differ, the stage of growth and the method of cutting and storing also affect the length of time these vegetables will keep. For storage, the fruits should be allowed to remain on the vine until their stems are quite withered and then they must be cut off with about 2 inches of stem adhering. If the stem is removed, rots may start at the stem end.

Pending maturity, and if the fruits are resting on wet soil, it is advisable to slip a small board or piece of tin under them as rots can start if they are left in contact with damp soil, and, for the same reason, stored vine vegetables should never be

placed on the ground but on some form of rack. If they are heaped, stack them so that the air will circulate right round them. As a general rule, small pumpkins, squash, or marrows keep longer than the large fruits which should be used first, and all should be protected from mice and rats.

PARSLEY

The leaves of parsley taken from young plants are superior to those from old plants, and it is advisable to make two sowings. Early March sowings will provide pickings until the August–September sowings are ready. All parsley seed is slow in germination, and, for this reason, it is a good plan to germinate the seed between folds of damp flannel or sacking, planting out as soon as they sprout. The alternative is to sow the seed mixed with that of a quick-growing plant like radish or lettuce. This will mark the rows for weeding purposes. Thin out the seedlings to 10 inches apart for good leaves. Parsley will transplant, but this slows their rate of growth to maturity and usually the foliage is somewhat coarse. Parsley will grow almost anywhere, but it responds to well-manured ground and side-dressings of sulphate of ammonia applied during the picking season every month or so will help to keep the plants in profit. When the flower stem appears, the plants have reached maturity and are best replaced, but they can be kept in fair leaf for some time if the flower bud is promptly removed.



Triamble pumpkin, an excellent "keeper".



Side-dressings for growing crops are best applied in a furrow 3 inches deep and 3 or 4 inches on each side of the row.

[After Hawaii Agr. Exp. Stn. Bull. No. 91.]

SIDE-DRESSINGS FOR GROWING CROPS

As we are approaching cooler weather and shorter days, it is advisable to stimulate all growing plants during March by side-dressings, and with plenty of water if the weather is dry so that they will be forward before growth slows down next month. Late tomatoes in the south will benefit by the immediate application of sulphate of ammonia at the rate of about a teaspoonful per plant. All winter leaf vegetables, leeks, and celery should be dressed with superphosphate and ammonia (4-1) every three weeks in bands on each side of the plants at the rate of 1 oz. per yard of row. Liquid manures may be used, but only after rain or watering.

THE FLOWER GARDEN

By T. H. Kneen, B.Agr.Sc., Principal, School of Primary Agriculture and Horticulture, Burnley Gardens

IN many gardens there is a need to provide shrubs and trees which will bloom in mid-summer, to fill the gap between the spring and autumn peaks of blooming. We deliberately avoid bringing our annuals, dahlias, gladioli, &c., into full bloom in January and February because their life in the intense heat of those months is likely to be brief and the blooms are likely to lack quality. There are several commonly-grown shrubs and trees worthy of consideration to help fill this gap, and the following lists, which are by no means comprehensive, may prove helpful in making a selection from catalogues which should be consulted for further descriptive details. Most of the plants listed are evergreens—deciduous plants are distinguished by the letter (D) in brackets after the botanical name.

Several popular variegated plants have been mentioned, as they are certainly valuable in maintaining interest in "off" periods, and, especially in summer, when they add a note of coolness to the garden. Useful varieties of each plant have been indicated in some cases, together with the colour of the flowers.

SMALL SHRUBS GROWING 3 TO 4 FEET IN HEIGHT

Abelia chinensis (syn. *rupestris*)—rose and white.

Abelia Schumannii (syn. *longituba*)—rose lilac.

Abutilon vitifolium, var. *Emperor*—bright red.

Abutilon vitifolium, var. *Sydney Belle*—golden yellow.

Ceratostigma Willmottiae (D)—rich sky-blue.

Erythrina Blakeii (D)—The Coral Tree—dark crimson.

Erythrina Humeana (D)—The Coral Tree—dark crimson.

Ochna multiflora—yellow with prominent red sepals.

Rondeletia anomala—coral red.

Spiraea bumalda, var. *Anthony Waterer* (D)—crimson.

LARGER SHRUBS GROWING 4 TO 8 FEET IN HEIGHT

Cestrum aurantiacum—golden yellow.

Clerodendron Bungei—rose red.

Clethra arborea—The Lily of the Valley Tree.

Hibiscus rosa-sinensis, var. *General Courteges*—scarlet.

Hibiscus rosa-sinensis, var. *Agnes Gault*—cerise.

Hibiscus rosa-sinensis, var. *Peachblow*—pink.

Hibiscus syriacus (D), var. *Coelestis*—blue.

Nerium oleander—The Oleander—available in white, pink, and crimson, single and double varieties.

Tecoma capensis—orange scarlet.

TREES

Calodendron capensis—The Cape Chestnut. This is a showy tree with its profusion of rose-lilac blooms which may not appear for several years. Most specimens seen are 20 to 30 feet in height, but, under favourable conditions, it may attain a height of 50 feet or more. A spreading tree.

Jacaranda ovalifolia (semi-deciduous)—mauve blue—15 to 20 feet.

Eucalyptus ficifolia—Scarlet Flowering Gum—colours range from white to scarlet—15 to 20 feet.

Cornus capitata—The Dogwood—large, creamy-white flowers followed by strawberry-like fruits—8 to 12 feet.

Tamarix pentandra (D)—Flowering Cypress—carmine—10 feet.



A fine specimen of the variegated pittosporum,
Pittosporum eugenoides variegata.

SOME LARGER VARIEGATED SHRUBS GROWING 4 TO 8 FEET

Acer negundo aureo-variegatum.

Euonymus japonicus aurea.

Ligustrum lucidum aureo-variegatum—
yellow-leaf Glossy Privet.

Ligustrum ovalifolium aureo-variegatum—
Californian Golden Privet.

Nerium oleander variegatum.

Pittosporum eugenoides variegatum.

Rhamnus alaternus variegata—The Varie-
gated Buckthorn.

GLADIOLUS THRIPS

Severe infestations of gladiolus thrips were noticed earlier in the year, and were the cause of many blooms being distorted and sometimes failing to open at all. The attack was made evident by the develop- ment of silvery streaks on the foliage which, if the streaks became extensive, took on a rusty appearance. The damage, even with an apparently light infection, is certainly severe enough to warrant control measures being taken. Further, thrips feed on the corms during storage and may seriously damage the root zone of the corm.

Effective control is obtained by the use of D.D.T.—1 oz. of 20 per cent. emulsion to 2½ gallons of water—when the attack is first noticed. It is well to examine the plants carefully as thrips are to be found feeding within the folds of the foliage and flower spikes. The corms may be treated in storage by fumigation with naphthalene for at least three weeks, using 1 oz. of naphtha- lene flakes per 100 corms in a box or tin with a tightly-fitting lid. The corms must be removed from the fumigant before sprouting commences, as otherwise injury will occur.



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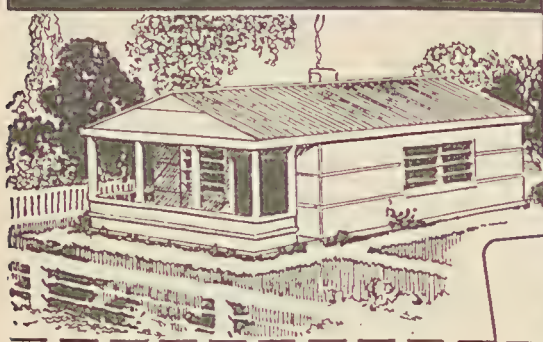
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WHEAT CROP CHAMPIONSHIPS

1947

Wimmera, Mallee and Northern Districts

The District Wheat Crop Championships, which are held in the Wimmera, Mallee, and Northern Districts, are conducted by the Farm Competitions Association of Victoria, which consists of representatives of the Department of Agriculture and affiliated agricultural organizations in the wheat belt.

The Championship is for the best 50 acres of wheat exhibited in the local competitions held by the District Agricultural Societies or Branches of the Victorian Wheat and Wool Growers' Association. The main objective of the competitions is to gather and disseminate the methods used in the production of the best wheat crops.

The prize money of £50 for each Championship was again donated by the Royal Agricultural Society of Victoria, to be awarded on the basis of £25 to the grower of the champion crop and £15 and £10 to the Agricultural Societies or organizations nominating the first and second-best crops respectively in the Championship final.

Ten societies competed in the Wimmera Championship and five in both the Mallee and Northern zones, and, in all, 209 crops were exhibited. In accordance with the rules, the Champion crop in each district was harvested under the supervision of an Officer of the Department of Agriculture, who certified to the yield and area of the winning exhibit. The Championship is not judged solely on yield—other factors including the purity and type of seed, freedom from weeds and disease, and the general evenness of the exhibits are also taken into consideration.

The prizes for the Championships were presented to the winning competitors and Societies at the Annual Conference of the Victorian Wheat and Wool Growers' Association held last month in the Assembly Hall, Melbourne.

THE WIMMERA CHAMPIONSHIP

Report of the judge, A. B. HACKWELL, B.Agr.Sc., Senior Agronomist

An analysis of the wheat production in the various districts of the State over the past twenty years shows that the Wimmera normally produces 40 per cent. of the Victorian wheat crop. In the decade ending 1946-47 this district contributed 43.6 per cent. of the total crop, its output in the 1946-47 season being an all-time record, namely, 21½ million bushels from 1.02 million acres.

In the past season, 1947-48, there were prospects at one stage of exceeding that record, but, with the development of rust in many crops and the advent of excess rain in some areas, the returns declined accordingly. Notwithstanding these factors, another splendid harvest was produced in this district, and, pending the final figures, it is anticipated that the output for 1947-48 will be well above average. The general grain sample, however, was not up to the usual standard in bushel weight, although the flour quality was not seriously affected.

SEASONAL CONDITIONS, 1947

Throughout the Wimmera the rainfall for the year was well above average, the increase over the mean being more than 6 inches in the western sector, Kaniva-Nhill-Goroke, and from 2 to 5 inches in the eastern and central sections.

The table on the next page shows the rainfall recorded at thirteen centres for the full year, and for the months of June to November inclusive. The long-term averages for each period are also given. Although the total rainfall varied in amount from 18 inches in the eastern sector, Charlton-Wycheproof-Donald, to over 26 inches at Kaniva and Goroke, the general incidence of the falls was fairly similar throughout the whole of the Wimmera.

Following good opening rains in the early autumn, a dry period set in throughout May, and the bulk of the wheat sowing had to be deferred.

WIMMERA RAINFALL (IN INCHES).

For 1947 and long-term average.

Centre.	Total for Year.		June to November.	
	1947.	Average.	1947.	Average.
Kaniva ..	26.5	17.8	16.4	11.2
Nhill ..	22.5	16.3	13.6	10.0
Dimboola ..	21.1	16.0	12.6	9.8
Goroko ..	26.9	20.2	16.8	13.0
Natimuk ..	22.9	17.4	14.2	10.7
Horsham ..	20.1	17.7	12.4	10.6
Murtoa ..	20.0	16.0	12.7	9.4
Rupanyup ..	21.9	16.6	13.4	10.0
Jeparit ..	18.1	14.9	11.0	8.7
Warracknabeal ..	18.7	15.1	12.3	9.0
Donald ..	18.6	15.8	11.9	9.4
Charlton ..	18.2	16.6	12.4	9.7
Wycheproof ..	17.6	14.4	11.4	8.5

The winter rainfall from June to August was heavy, exceeding the average by 2 to 3 inches in the western sector and up to 1 inch elsewhere. The September recordings were normal, and, at mid-spring, the prospects were very favourable. During October and November, from 4 to 5 inches were received throughout the whole of the district, representing almost twice the usual amount. The repeated falls in late spring, accompanied by high humidity and relatively windless conditions, were conducive to rust, and this disease, unfortunately, appeared in many crops. Foot-rot diseases, causing deadheads, also developed in some areas.

The rains continued into December when from 2 to 3 inches were generally recorded, delaying the ripening for a week or two. Rust appeared in the late crops during that month.

Reviewing the rainfall from June to November, which represents the bulk of the growing period, the greater portion of the Wimmera received from 2 to 3 inches more than the normal for that period, and, notwithstanding the seasonal difficulties, some splendid crops were produced. The rust and one or two minor contributing factors reduced the harvest from an excellent one to a fairly good one. The best crops inspected yielded a little over fifteen bags per acre. Many paddocks would return from twelve to thirteen bags, and considerable areas more than ten bags per acre. Only on a relatively small proportion of the district, mainly in the extreme west, was the harvest a poor one.

Another feature of the season was that the weather from August to December was cooler than usual. The mean daily temperature at Nhill and Donald (in degrees Fahrenheit) was as follow:—

		Nhill.		Donald.	
		1947.	Normal.	1947.	Normal.
August	..	48.3	49.4	48.5	49.6
September	..	52.4	53.3	53.5	53.6
October	..	55.6	58.1	56.5	58.8
November	..	60.3	63.6	63.6	65.0
December	..	66.9	68.2	69.3	69.5

Some of the crops had not stooled out to the usual extent, probably an effect of the colder and wetter conditions.

RUST AND DEAD-HEADS

Rust is an air-borne fungous disease* which thrives in continued wet and muggy weather and is seldom encountered in the Wimmera. The severity of the 1947 out-break

* Descriptive notes on rust are given on page 172 of this issue and in other reports on the local wheat crop competitions recently issued. Copies of these reports are available from the Department of Agriculture, Melbourne, C.2.



The Donald entry in the Wimmera Championship. harvesting his crop of Quadrat at Swanwater West. per acre.

Mr. W. D. Wells
Yield, 40.2 bushels



Harvesting wheat experimental plots on the property of Mr. E. W. Dahlenburg, Salisbury, near Nhill, January, 1948.

varied throughout the district and from crop to crop. The stage of maturity of the particular crop at the time conditions were favorable for infection was an important factor in the extent of the attack.

The main infection in the Wimmera occurred in early December and those crops which were most advanced in maturity escaped any appreciable damage. In the north-eastern sector, including Warraeknabeal, losses from the rust were relatively small. In crops that were at a later stage, particularly Magnet, and in the wetter localities in general, especially Kaniva, the disease took considerable toll, affecting both the yield and the sample.

A most interesting feature was that many of the rusted crops finished better than was expected. At harvest they returned a higher yield than had been anticipated and, in some cases, a very good yield. This was no doubt contributed to by the relatively cool weather and absence of scorching winds during the ripening stages, and possibly by the wheats possessing some degree of tolerance to the disease.

With regard to the deadheads, these were more prevalent than usual, generally in a scattered form through the crop. They were caused by the diseases take-all and root-rot, which attack the plant at the roots and base of the stem. These diseases appear

WIMMERA CHAMPIONSHIP ENTRIES, 1947.

District Agricultural Society.	Number of Crops in Local Contest (50 Acres).	Representative in Championship.	Variety.	Certified Yield.
				bush./acre.
Dimboola	9	H. F. Budde, Dimboola	Quadrat	46.1
Horsham	11	W. E. Dahlenburg, Dahlen	Quadrat and Pinnacle	42.3
Donald	12	W. D. Wells, Swanwater West	Quadrat	40.2
Nhill	25*	J. R. Dahlenburg, Kiata	Quadrat	45.9
Murtoa	5	E. E. Krelle, Minyip South	Quadrat	..
Charlton	7	W. H. Woods and Son, Charlton	Insignia	..
Warraeknabeal	23	W. G. Rodda, Aubrey	Magnet and Diadem	..
Natimuk	9	C. L. Sudholz, Natimuk	Quadrat	..
Goroke	11	B. Lavery, Lake Karnak	Magnet	..
Kaniva	9	A. J. Goldsworthy, Kaniva	Diadem and Quadrat	..
Total	121			

* These represented 35 entries—there were also 10 crops in the 25-acre sections for red land.

in the wheat crop every year to a minor extent, but on this occasion the seasonal conditions were more conducive to their spread. The over-all loss from this trouble, however, was comparatively slight. These soil-borne diseases are difficult to control, but may be reduced by the application of a sound rotation system which includes oats, the preparation of good fallow, and liberal manuring.

WHEAT VARIETIES

The early wheat, Insignia, which was grown in the Wimmera on limited areas only, and Quadrat, generally showed less damage from the rust than the other standard wheats, whereas the late-maturing Magnet was often the worst-affected variety. None of the Victorian varieties is completely resistant to this disease although some exhibit a lesser degree of susceptibility than others.

Great interest is being taken in Insignia, the new Mallee wheat which gave such good yields throughout the Wimmera plots under the rust conditions prevailing last year. As shown in the following table it was the leading variety in five centres and equal top with Quadrat at one other station.

WIMMERA WHEAT TESTS, 1947.

(Yields in Bushels per Acre.)

Variety.	Longerenong.	Salisbury.	Kaniva.	Donald.	Charlton.	Warracknabeal.
Insignia ..	30.9	43.9	26.9	28.5	35.7	30.9
Quadrat ..	30.9	42.6	21.9	24.3	34.4	27.0
Pinnacle ..	30.2	40.5	19.6	24.9	33.0	27.4
Ghurka ..	29.6	40.9	21.6	24.8	32.0	25.4
Diadem ..	28.6	39.4	16.5	24.2	31.4	25.8
Magnet ..	26.2	40.3	16.9	24.5	29.2	25.7

In the four years prior to 1947, however, Insignia had not done so well in the black land tests at the three centres, Longerenong near Horsham, Salisbury near Nhill, and Kaniva, and in the average results over the

five-year period, including 1947, this variety has the lowest yield of the above six wheats, viz. :—

WIMMERA TESTS ON BLACK LAND.

(Wheat Yields in Bushels per Acre.)

Variety.	Average 5 Years, 1943-47.		
	Longerenong.	Salisbury.	Kaniva.
Pinnacle ..	31.0	30.5	34.7
Quadrat ..	29.9	31.5	34.6
Magnet ..	27.6	30.5	35.6
Diadem ..	29.0	28.7	30.8
Ghurka ..	27.6	29.2	32.3
Insignia ..	27.5	28.3	27.7

The average returns over a long term are a better guide for district practice than the yields in one particular season and, from the above results, Insignia cannot be recommended for sowing on strong Wimmera black land.

Insignia, however, has done relatively better at the other centres in the Wimmera as set out in the following table, and has given promise of being a suitable variety on the red and chocolate soils especially in the eastern section, and on the "fringe" country to the north of the district. Insignia, which was produced at the Mallee Research Station at Walpeup, has proved an outstanding variety throughout the Mallee.

WIMMERA TESTS ON OTHER SOILS.

(Wheat Yields in Bushels per Acre.)

Variety.	Charlton (Chocolate).	Donald (Mixed).	Warracknabeal (Red Loam).
	Average 6 Years, 1942-47.	Average 2 Years, 1946-47.	Average 2 Years, 1946-47.
Insignia ..	24.4	29.8	24.0
Quadrat ..	22.2	26.4	26.0
Diadem ..	21.9	29.6	26.4
Pinnacle ..	21.7	27.2	24.8
Magnet ..	21.1	27.8	25.4
Bencubbin ..	19.8	27.9	26.0
Ghurka ..	20.8	27.0	23.8
Pindar ..	20.5	25.2	24.8

In other States where rust is more frequently experienced, rust-resistant varieties have been developed in recent years. Some of these such as Gabo, Charter, Warigo, and

others, have been tested in experimental plots in Victoria, but up to date have not shown the yielding ability of our standard varieties, except under rust conditions.

On the question of rust in relation to choice of varieties for future sowing, the position should be kept in its right perspective. As it is extremely rare for rust to develop in epidemic form in the Wimmera, varieties which farmers have found to be good yielders over an extended period should not be discarded merely because of a relatively lower return due to the rust last season. Similarly the sowing of varieties which do well only in the occasional rusty season, would mean a big sacrifice in yield if regularly grown.

The wheats recommended for the Wimmera by the Victorian Wheat Advisory Committee, which consists of representatives of the wheatgrowers, millers, bakers, merchants, and the Department of Agriculture, are as follow :—

Wimmera black soils—

Pinnacle, Quadrat, Magnet, Diadem.*

Wimmera red and "fringe soils"—

**Pinnacle,* Quadrat, Magnet, Diadem,*
Insignia,* Bencubbin.**

* Recommended for trial sowings pending further evidence.

THE CHAMPIONSHIP ENTRIES

Ten Agricultural Societies representing most of the main centres in the Wimmera conducted local wheat crop competitions and participated in the 1947 Championship, the sixth of the series. In all, 121 crops, each 50 acres in area, were exhibited in the local contests and the winners who had the honour of representing their districts in the Championship final are listed in the table on page 147.

The ten exhibits in the final were all inspected by the Championship judge. The yield of the four heaviest crops ranged between 40·2 and 46·1 bushels per acre, and the average of the ten crops would be approximately 39 bushels per acre. Considering the adverse factors associated with the season, this was a decided achievement and again demonstrated the high standard of farming methods generally practised throughout this important wheatgrowing district.

THE CHAMPION CROP

The Wimmera Championship for 1947 was won by Mr. H. F. Budde of Dimboola with an excellent exhibit of Quadrat which yielded 46·1 bushels per acre from 52·7 acres, part of a 100-acre paddock of heavy black



Carting wheat from the champion wheat crop of the Wimmera, 1947, grown by Mr. H. F. Budde, Dimboola. This crop of Quadrat yielded 46·1 bushels per acre.



Weighing the produce from one of the observation plots in wheat experiments at Salisbury.

ground. The crop was harvested in the presence of Mr. L. M. Needham, Field Officer, who judged two of the local competitions, and in accordance with the rules, certified to the area and yield. The champion crop was clean, even and well-grown and was awarded $96\frac{1}{2}$ out of a possible 100 points. The purity of the seed was of moderately good standard. The wheat showed only a slight infection of rust, the grain sample weighing 65.4 lb. per bushel.

The crop was grown on land which had been farmed for fifteen years on the three-course rotation, fallow-wheat-pasture, and prior to that on a shorter rotation, fallow-wheat. In 1946 the paddock was late summer-fallowed with a skeleton-mouldboard plough in April, scarified in July, September, November, shear-harrowed in December, February and March, scarified again in April and shear-harrowed in May. It was sown in the first week of June with 75 lb. of seed, dry pickled with mercurial powder, and 75 lb. of superphosphate per acre and was not fed off. Following 55 points in May the rainfall on the property from 1st June to 30th November, 1947, was 1,030 points.

COMMENTS ON THE OTHER CROPS

The second award was gained by Mr. Wilfred E. Dahlenburg, the Horsham representative, with a particularly dense crop consisting of Pinnacle and Quadrant. This crop secured $93\frac{1}{2}$ points. Despite a heavy infection

of rust late in the season, the exhibit gave a splendid yield, the Pinnacle returning 45.4 bushels and the Quadrant 39.2 bushels per acre. The average yield over the 50 acres was 42.3 bushels per acre, the sample weighing 59 lb. per bushel.

The crop was relatively free from weeds, even, and of fairly good type. This entry also was portion of a paddock of strong black land farmed on the three-course rotation, fallow-wheat-pasture, two crops of oats having been sown in lieu of the pasture during the past eighteen years.

The stubble on this property has not been burnt for a long period. The fallow was given a thorough preparation as evidenced by the following programme. It was ploughed with a skeleton-mouldboard implement to a depth of 4 inches in April, 1946, scarified early in June and again in August and October. The shear-harrows were then used in November and December and five times during January to March. The fallow was scarified and shear-harrowed again in April and sown in the last week of June with 70 lb. of seed pickled with mercurial powder, and 1 cwt. of superphosphate per acre. It was harrowed a few days later and fed off bare with sheep for two days in the first week of August.

Mr. W. Deane Wells, a young ex-service-man of Swanwater West representing the Donald Society, came third with a very creditable crop of Quadrant which yielded 40.2 bushels per acre. The sample weighed 64.7 lb. per bushel. The exhibit was portion of a 250-acre paddock of wheat which returned an average of 39 bushels per acre. The crop which was clean and even, showed a very good standard of purity and scored $92\frac{1}{2}$ points. It was grown on chocolate clay loam, the paddock having been under fallow-wheat for some 20 years, with a spell in grass in 1943. The land was skim-ploughed in April and mid-winter, with a harrowing in between, spring-toothed then shear-harrowed in January and April, portion spring-toothed again and sown in the last week of June

with 80 lb. of dry-pickled seed and a similar quantity of superphosphate per acre. The rainfall on the property, after 31 points in May, was 1,232 points from June to November and 131 points in December.

The Nhill representative, Mr. John R. Dahlenburg of Kiata, came fourth with 91 points for a dense, well-headed crop of Quadrat on black land at Salisbury, now farmed on a three-course rotation. It was grown on the property of Mr. A. F. (Bert) Dahlenburg who came second in the 1946 Championship. A test yield of the exhibit registered 45.9 bushels per acre. The entry was one of the heaviest crops inspected but, compared with the winning exhibits, it lost points in regard to weeds, disease, and purity of the seed. The crop was grown on summer fallow which had been disced in February, scarified in June and cultivated once during spring. The land was given three strokes with the shear-harrows from February to early May and sown in mid-May with 70 lb. of seed, 63 lb. of superphosphate and 2 to 3 lb. of zinc "residue" per acre.

The entry of Mr. E. E. Krelle, the Murtoa representative was a very creditable crop of Quadrat estimated to yield approximately thirteen bags per acre.

Messrs. W. H. Woods and Son of Charlton, with a good crop of Insignia, and Mr. W. Gordon Rodda, who represented the Warracknabeal Society with Magnet and Diadem, each exhibited a very commendable entry. The crops showed little rust, and the grain sample was particularly good.

The Natimuk and Goroke Societies, competing for the first time, were represented by Mr. C. L. Sudholz with a crop of Quadrat, and Mr. Basil Lavery of Lake Karnak, with an entry of Magnet. In both districts the annual rainfall was over 5 inches above normal and the crops were affected to some extent by the wet conditions, inducing rust and deadheads. Although the former entry was not sown until early in August the bulk

of the crop was well-headed and a fairly good yield was indicated. Mr. Lavery's crop had been sown early in May; over the bulk of the area it was particularly dense, but through rust and other factors a moderate yield was anticipated.

The Kaniva district, in which the winning crops in the last two Championships were grown, had an excessively wet season in 1947, the annual rainfall being 8.7 inches above average. In this locality the effect of the rust was disastrous, causing on most farms considerable losses in yield and a badly pinched sample.

Mr. A. J. Goldsworthy's crop of Diadem and Quadrat, which represented the district, had made exceptionally heavy growth, being tall, dense, with very large heads. It was an outstanding crop, but unfortunately was badly affected with rust.

THE 1947 PRIZES AND LIST OF WINNERS

The prizes for the 1947 Championship were awarded as follows:—£25 and certificate to Mr. H. F. Budde of Dimboola, £15 to the Dimboola Agricultural and Pastoral Society and £10 to the Horsham Agricultural Society.

The winners of the Wimmera Championship since the inception of the competition in 1938 are as follows:—

Year.	Wimmera.	Agri-cultural Society.	Variety.	Certified Yield.
				bus./ac.
1938	H. Cramer ..	Nhill	Ghurka	32.5
1939	L. H. Clark ..	"	"	49.3
1940	C. P. Dahlenburg	"	"	35.1
1941	V. H. Baldock ..	Kaniva	Magnet	45.7
1946	C. H. Champness	"	Magnet and Quadrat	53.8
1947	H. F. Budde ..	Dimboola	Quadrat	46.1

THE MALLEE CHAMPIONSHIP

Report of the judge, H. L. HORE, B.Agr.Sc., Senior Agronomist

Five Mallee Societies competed in the District Wheat Crop Championship of 1947. This was won by Mrs. A. Olson of Nowie North. The winning exhibit was nominated by the Swan Hill Agricultural and Pastoral Society. Mr. F. J. Hofmaier, of Hopevale, winner of the Beulah local competition, and Championship winner in 1946, was second, and Mr. W. G. Chivell, the Hopetoun competition winner, occupied third place. The other exhibits in the Championship final were those shown by Mr. T. J. F. Morley, representing the Nullawil district, and Messrs. Gniel Bros., who represented Walpeup.

The varieties exhibited by the above competitors are listed in the table hereunder. In all, 31 crops each of 50 acres, were entered in the five local competitions.

SEASONAL CONDITIONS

The rainfall for the 1947 season in the Mallee was more favourable than that experienced for several years. Heavy rains fell in February and March, enabling fallows to be brought into good condition in readiness for sowing, which, in some cases, commenced early in April. Crops sown at that time germinated well and made

rapid growth, but most farmers delayed sowing, awaiting a further rain and the more normal seeding time.

April, May, and most of June was exceptionally dry over most of the Mallee, and many crops sown during those months germinated patchily, and, in some cases, were badly cut back by windblown sand.

Following the break at the end of June, excellent conditions were experienced, and early in October high yields were forecast in many districts.

The moist and warm conditions so favourable to the growth of crops was also favourable to the development of rust, and this disease made its appearance in October and November. In the Millewa district many crops were ruined by rust and elsewhere in the Mallee crops suffered from the disease in varying degrees, depending largely on their stage of maturity when attacked and on the severity of the infection.

Although none of the crops entered in the competition showed evidence of damage due to frost, losses due to this cause occurred on some farms. Cool weather and rain in December delayed harvesting beyond the normal time.

MALLEE CHAMPIONSHIP ENTRIES, 1947.

District Agricultural Society.	Number of Crops in Local Contest (50 Acres).	Representative in Championship.	Variety.	Certified Yield.
Swan Hill	7	Mrs. A. Olson, Nowie North ..	Quadrat ..	bus./acre. 33.1
Beulah	7	F. J. Hofmaier, Hopevale ..	Bencubbin ..	29.5
Hopetoun	6	W. G. Chivell, Rosebery ..	Quadrat ..	26.3
Nullawil*	5	T. J. F. Morley, Nullawil ..	Regalia ..	..
Walpeup*	5	Gniel Bros., Walpeup ..	Insignia ..	..
Total	31			

* Local Branch of the Victorian Wheat and Wool Growers' Association.

The rainfall for 1947 (in points) in the five districts competing in the Championship was as follows:—

	Beulah.	Hopetoun.	Walpeup.	Nullawil.	Swan Hill.
January ..	9	..	6	..	60
February ..	77	76	216	31	106
March ..	248	234	216	249	189
April ..	82	75	30	25	28
May ..	46	29	29	..	27
June ..	140	98	95	103	101
July ..	260	230	169	256	152
August ..	127	108	136	90	90
September ..	151	136	111	109	94
October ..	267	191	180	237	242
November ..	226	223	133	209	200
December ..	233	234	265	130	111
Total for year ..	1,866	1,634	1,586	1,439	1,400
Total May–November ..	1,217	1,015	853	1,004	906

VARIETIES SOWN IN THE COMPETITION

Seven different varieties of wheat were shown in the local competitions participating in the Mallee Championship. The varieties exhibited are tabulated below.

On the five occasions the Mallee Championship has been held the varieties represented in the crops reaching the Championship final were:—Ghurka, 8 crops; Rancee 4H, 5; Bencubbin, 5; Quadrats, 4; Regalia, 2; and Sepoy, Magnet, and Insignia 1 each. The Championship has been won

twice with Ghurka (1939 and 1940), twice with Bencubbin (1941 and 1946), and once with Quadrats (1947).

It is considered that Ghurka has now passed the peak of its popularity not only in the Mallee but throughout the State. In so far as the Mallee generally is concerned the three best wheats from the yield point of view are Insignia, Bencubbin, and Quadrats. These wheats have general suitability, and fulfil the farmer's requirements as regards time of maturity, harvesting characteristics, disease resistance, &c. Of the three varieties, Insignia is the earliest in maturity. Bencubbin also is considerably earlier than Quadrats which can be classed as a mid-season to late-maturing variety. They differ somewhat in their habit of growth and length of straw, but all possess good harvesting characteristics except that Bencubbin frequently exhibits a straw weakness, and, for that reason, should be limited to areas which can be readily handled at harvest time. Each of these wheats is resistant to flag smut, and Insignia and Quadrats also show a measure of field resistance to rust. Bencubbin can usually be relied upon to make sufficient length of straw for hay-cutting purposes. Insignia is a comparatively new variety, as it was first released to growers from the Mallee Research Station in 1946, but its results in experimental plots and on farmers' properties have been so favourable that it is anticipated that within a very few years this variety will be the most widely-grown wheat in the Mallee. The yields obtained from the standard varieties of wheat in

WHEAT VARIETIES IN LOCAL COMPETITIONS IN THE MALLEE, 1947.

District.	Variety.						
	Bencubbin.	Insignia.	Quadrat.	Rancee 4H.	Regalia.	Pindar.	Sepoy.
Beulah	2	1	3	1	..	..	..
Nullawil	1	..	..	1	3	..	..
Hopetoun	..	2	2	..	1	1	..
Walpeup	3 $\frac{2}{3}$	1	..	..	..	$\frac{1}{3}$	1
Swan Hill	1	1	4	..	..	1	..
Total	7 $\frac{2}{3}$	5	9	2	4	2 $\frac{1}{3}$	1

The variety Quadrats won two of the local competitions in the Mallee in 1947 (also the Championship) while Insignia, Bencubbin and Regalia were each successful in one competition.



Growers of the Champion Wheat Crops for 1947 receiving their awards. Left to right: Mr. John Dunne, Springhurst, winner of the Northern Championship; Mr. P. R. Olson, Nowie North, husband of the Mallee Championship winner, and Mr. H. F. Budde, Dimboola, winner of the Wimmera Championship.

[*"Weekly Times"* photo.]

experimental plots conducted by the Department of Agriculture at various centres in the Mallee are as listed in the table hereunder.

COMMENTS ON THE CROPS

Mrs. A. Olson's winning crop of Quadrat was outstanding in regard to yield. Harvested under the supervision of a Departmental officer, the crop returned 33·1 bushels

in" during the first week in May, using 72 lb. of dry-pickled seed and 70 lb. of superphosphate per acre. The wheat germinated on moisture in the ground and it was not fed off during its growth. The crop had practically escaped the rust, and, except for an odd deadhead, was free of diseases. Purity and type were good, but not outstanding.

The crop placed second, an exhibit of Bencubbin shown by Mr. F. J. Hofmaier,

per acre over the competition area of 50 acres. The grain was nicely filled and of good colour, and weighed 63·8 lb. per bushel.

The paddock in which the champion crop was grown is a red, sandy loam interspersed with slight rises. It had not been cultivated for three years prior to fallowing. The fallow was prepared by ploughing to a depth of 3½ inches in July with a twin-dise, cultivating with a tandem-dise in September, and again in October. Following rains in the autumn, the paddock was again worked in each of the months of February, March, and April, and the crop was "combined

WHEAT VARIETY TRIALS AT SIX CENTRES IN THE MALLEE.

Variety	Mallee Research Station, Waipup (Average 8 Years, 1940-47).			Woomelang (Average 7 Years, 1941-47).	Ultima (Average 7 Years, 1941-47).	Berriwillöck (Average 5 Years, 1943-47).	Murrayville (Average 2 Years, 1946-47).	Manangatang (Average 2 Years, 1946-47).
	bush./acre.	bush./acre.	bush./acre.	bush./acre.	bush./acre.	bush./acre.	bush./acre.	bush./acre.
Insignia	17·8	19·2	12·1	17·1	17·0	24·4		
Bencubbin	16·3	17·5	10·7	13·8	16·0	25·2		
Quadrat	16·7	16·0	9·5	15·7	18·6	20·6		
Regalia	15·3	16·7	10·5	14·5	13·2	18·6		
Pindar	14·9	13·3	8·6	13·9	15·1	17·8		
Ranee 4H	14·5	16·3	10·0	14·2	14·7	17·4		
Ghurka	14·4	12·9	8·8	13·7	16·5	18·2		



'Ceresan' *Wins Again!*



Mr. E. P. Verco standing in his
South Australian Championship
Wheat Crop. Season 1946-47.
The crop was grown from
seed dry-pickled with
'CERESAN'



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had made prolific growth and had lodged sufficiently to make stripping difficult, although crop lifters enabled the full yield to be gathered. The crop looked much better than it yielded, as rust had had a very appreciable effect on the development of the grain, which had a bushel weight of 61.0 lb. compared with 65.1 lb. with the same variety on the same farm in the previous season. The sample contained a number of small and thin grains. The certified yield of this crop was 29.5 bushels per acre. The paddock has been cultivated frequently in recent years. For the last crop it was fallowed with a twin-disc plough to a depth of 3½ inches early in July, and worked with a tandem-disc early in November and again in February. In April it was scarified, and the crop was "combined in" during the third week of May using 75 lb. of dry-pickled seed and 1 cwt. of superphosphate per acre.

Mr. W. G. Chivell's crop of Quadrat was placed third, returning a certified yield of 26.3 bushels per acre. This was a nice competition crop, but did not have the body of the two former exhibits. The grain sample harvested was very good and weighed 65.1 lb. per bushel. The paddock was heavier ground than that on which many of the other exhibits were grown, and had been fallowed with a twin-disc 2½ to 3

inches deep in July, worked with a spring tooth in September and again in March, harrowed late in May, and "combined in" during the first week in June with 75 lb. of dry-pickled seed and 75 lb. of superphosphate per acre.

Rust was responsible for some reduction in the yield of the crops representing the Nullawil and Walpeup districts. Mr. T. J. F. Morley's crop of Regalia yielded 24½ bushels per acre (approximately), Messrs. Gniel Bros. Insignia 20 bushels per acre (approximately).

LIST OF WINNERS

The winners of the Mallee Championship since the inception of the competition are as follows:—

Year.	Winner.	Agricultural Society.	Variety.	Certified Yield.
				bus./ac.
1939	G. S. Mahar	Kerang ..	Ghurka ..	36.0
1940	C. E. Carra..	Hopetoun	Ghurka ..	24.2
1941	C. E. Carra..	Hopetoun	Bencubbin	31.0
1946	F. J. Hofmaier	Beulah ..	Bencubbin	28.5
1947	Mrs. A. Olson	Swan Hill	Quadrat	33.1



General view of rotation field at the Mallee Research Station.

NORTHERN DISTRICT CHAMPIONSHIP

Report of the judge, J. A. MORROW, B.Agr.Sc., Manager, Research Station, Rutherglen



An attractive crop of wheat grown at Dookie.

A total of 57 crops, each of 50 acres, was entered in the local competitions conducted by the five Agricultural Societies which participated in the Northern District Wheat Championship for 1947. The winners of the local Contests whose crops competed in the Championship final are listed hereunder

The Championship was won by Mr. John Dunne of Springhurst, representing the Wangaratta Agricultural and Pastoral Society, by a narrow margin, with an exceptionally clean crop of Magnet which gave a certified yield of 39.8 bushels per acre. The crop was dense and even, and, although some rust was apparent, only

NORTHERN DISTRICT CHAMPIONSHIP ENTRIES, 1947.

District Agricultural Society.	Number of Crops in Local Contest (50 Acres).	Local Winner.	Variety.	Certified Yield Bush./ac.
Wangaratta	5	John Dunne, Springhurst ..	Magnet ..	39.8
Rutherglen	12	G. Pearce, Springhurst ..	Baldmin ..	39.8
Dookie	3*	A. Ford and J. McDonald ..	Quadrat ..	..
Maryborough	10	N. Forbes, Eddington ..	Quadrat ..	..
Yarrawonga	27	A. McPherson and J. E. Thom ..	Eureka ..	..
Total	57			

* In the Dookie Competition there were also 24 entries in other sections for wheat crop.

slight damage to the grain resulted. It was quite free from weeds, but a few small patches of take-all and some slight lodging were noticed.

The crop, which was awarded 97 points out of a possible 100, was grown on ground which had been under clover pasture for eight years. After carrying sheep through the spring the paddock was disced in the last week in November, harrowed, and then Wimmera-scarified in mid-February. It was scarified again during the third week in April and sown in early May with 68 lb. of seed and 90 lb. of superphosphate per acre.

Second place, with 96½ points (only half a point behind the champion crop), was gained by Mr. G. Pearce of Springhurst, representing the Rutherglen Agricultural Society, with a crop of Baldmin which also yielded 39.8 bushels per acre. This crop closely resembled the winning entry, being dense, even and free from weeds. The presence of a few off-type heads was responsible for the slight margin in the points allotted. This crop was also grown on clover-ley, the paddock having been sown to subterranean clover in 1932 and not cropped until 1947. It was grown without fallow. The paddock was ploughed in the first week in April and harrowed later that month. It was scarified and sown in mid-May using 68 lb. of seed and 90 lb. of superphosphate per acre.

Third place went to Messrs. A. Ford and J. McDonald of Dookie, whose entry of Quadrat was estimated to yield about 39 bushels per acre. This crop was also free from weeds but lost points under the headings of purity and evenness. It was grown on a paddock of Dookie red land which had been out to clover for a period of twenty years. Fallowing was carried out at the end of August with a mouldboard plough. It was worked with a spring-tooth cultivator in December and again after harvest. It was then harrowed and not touched again until sown with a combine at the end of May with 60 lb. of seed and 90 lb. of superphosphate per acre.

The standard of the five crops in the Championship final was so uniformly high that it was difficult to allot the placings, particularly for the first two positions. Mr. N. Forbes of Maryborough (Quadrat) and Messrs. McPherson and Thom of Yarrowonga (Eureka) also represented their districts in the Championship. Each of these crops was clean and dense, and the yield was estimated at 38 and 37 bushels per acre respectively, only slightly below those of the placed crops.

It is significant that four of the five crops eligible to compete in the Northern District Championship final were grown on clover-ley ground. The exception was the Yarrowonga entry which was grown on an old cultivation paddock. The Yarrowonga district, through soil and climatic conditions,



Harvesting a wheat crop in north-eastern Victoria.

does not grow subterranean clover sufficiently well for clover-ley farming, as practised at Rutherglen, to be undertaken as a normal farming system. By stimulating the growth of the natural trefoils, however, much can be done to maintain soil fertility, particularly where wheat growing occupies only a portion of the farming activities.

The system of clover-ley farming, demonstrated at Rutherglen Research Station (with an average annual rainfall of 22·2 inches) is becoming widely adopted in the north-east, and an indication of its successful application is given by the fact that the leading crops in the competitions were those grown following a period under clover pasture. The three placed crops in the Maryborough competition were also grown on old clover paddocks.

In the Rutherglen and Wangaratta districts, and part of the Maryborough district, clover-ley farming without winter fallow can be practised successfully.

In the Dookie district it is probably desirable to continue following the clover-ley, at least until more evidence is obtained from experiments now being conducted at Dookie college.

At Rutherglen, Wangaratta, and in similar districts it is possible to grow three or more crops in successive years after clover-ley without any significant falling off in yield. This can be achieved only where the clover paddock has been adequately topdressed and rationally grazed. Where proper attention has been given to the pasture, marked increases in yield can be expected.

The results from neglected pastures will be much lower relatively, and the first step in changing over to a clover-ley system is to ensure that the clover is given the best possible conditions for maximum growth.

The superphosphate necessary for this purpose will normally be amply repaid by the extra stock carried. After the paddock has been down to clover for several years (the actual time will vary with the establishment of the pasture, seasonal and other conditions) cropping can be resumed.

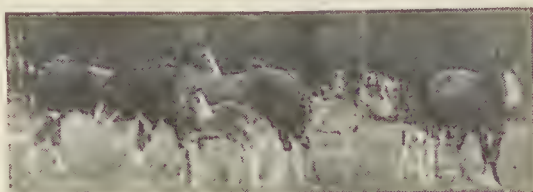
Under favourable conditions following can be omitted and the spring growth utilized for grazing. Depending on the length of the period under clover, two or three successive crops can be grown before the land is returned to clover pasture. At Rutherglen the second crop following clover-ley is almost invariably better than the first and it is desirable to grow at least two crops before resting the ground again.

The principle of clover-ley farming and the practice of rotating the crops round the farm paddocks is being widely adopted by progressive farmers, and there is a large area in the heavier rainfall sectors of the Northern Championship zone where it could be undertaken to advantage. The growing of wheat on early winter fallow, however, is still advocated for areas where the average annual rainfall is less than 21 inches.

LIST OF WINNERS

The winners of the Northern Championship since the inception of the competition are as follow :—

Year.	Winner.	Agricultural Society.	Variety.	Certified Yield.
1946	T. Klemm, Londrigan	Wangaratta	Magnet	50.15
1947	J. Dunne, Springhurst	Wangaratta	Magnet	39.8



"BLEACHED WHEAT"

A Review of the Effects of Rain on Mature Wheat

By E. J. O'BRIEN, A.A.C.I., Cereal Chemist

THIS season many crops were damaged by rain before harvesting, and, although the degree of damage was slight, the presence of "bleached" wheat has again raised the question as to how far such wheat has deteriorated in quality and value. It is thought that millers and others would be interested in recent investigations regarding the milling and baking quality of wheat affected in this way.

The most striking changes which take place in mature wheat subjected to wetting are :—

- (1) Replacement of the bright exterior colour by a dull bleached appearance ;
- (2) Change of internal appearance from a translucent texture to one which is opaque and chalky ;
- (3) Lowering of the bushel weight.

These changes are easily observed and have given rise to a prejudice against the use of such wheat which, in most cases, is quite unjustifiable. The unanimous opinion of investigators in the U.S.A., New Zealand, and Australia, whose published reports are summarized below, is that bleaching without sprouting does not cause any reduction in either milling or baking quality.

REVIEW OF LITERATURE

Swanson (1) in a recent and extensive bulletin states that the lowering of the test weight as a result of wetting is due to the roughening of the bran coat and swelling of the kernel as a whole.

The former may result from relatively small amounts of wetting ; the latter does not take place unless the moisture has increased to about 22 per cent. or more.

These changes, due to wetting, do not decrease flour yield nor injure the baking

value. Flour yield depends primarily upon the quantity of endosperm in the kernel, and, since no endosperm is lost and the moisture content of bleached wheat at harvesting is similar to bright grain, there should be no reduction in flour yield. Furthermore, the flour ash percentage averaged no higher from wetted wheat than from non-wetted wheat and it may be concluded that separation in milling is not made more difficult by wetting.

Loaf volumes were, as a rule, greater with equally good textures from the wetted wheat as compared with the non-wetted, and Swanson attributes this to the beneficial aging effects of wetting which accelerates normal biological changes.

Experimental evidence is presented which indicates that sprouting in the head is an unusual occurrence, and Swanson attributes this to the comparatively low viability of freshly-harvested wheat as compared with corresponding wheat several months after harvesting.

Cayzer (2) noted that light or bran bleaching has no noticeable effect upon milling or baking quality, but severe bleaching and possibly a slight degree of sprouting bring about some important changes in milling and baking quality. In the case of hard wheats, the milling and baking quality are both improved, but with soft wheats, the improvement is not so marked. He attributes the improvement to the better degree of maturity from the bleached samples.

Jewell and Miller (3) working on comparable samples of bleached and unbleached wheat from the Victorian harvests of 1930-31 and 1933-34, concluded that bleaching had no appreciable deleterious effect on flour yield or baking quality. They considered that the lower bushel weight of the bleached samples was due to an increase

in volume of the grains and not to leaching out of soluble constituents. The diastatic activity was increased in some cases by bleaching and this was reflected in better-baking properties.

Farquhar (4) examined samples of South Australian wheat of the 1937-38 crop which had been taken before and after rain. Sprouting had occurred in some samples and a lower flour yield was reported in these cases. Generally, he found that while protein contents were mostly lower in the bleached samples, diastatic activity had increased to a beneficial extent, and baking quality had improved with regard to loaf volume and texture.

Breakwell and Hutton (5) also found that the baking quality of bleached wheat was improved. They contend that the difference between bleached and unbleached grain lies in the gluten and that weathering causes the proteolytic enzymes in the grain to modify the gluten. Their tests showed that doughs from weathered samples have superior handling qualities, gas better, and yield bread of better quality.

Experiments conducted by the New Zealand Wheat Research Institute (6) under controlled conditions of weathering yielded results which agree with those quoted above.

COMMENTS

There is a body of scientific experimental work which unanimously proves that the milling and baking quality of bleached wheat is not impaired and that the baking quality may be actually improved, except where the amount of damage due to rain has resulted in sprouting or in fungous damage of the grain. There is, therefore, little justification for the view commonly held in the trade, that bleached wheat should be looked on with disfavour and not used for flour milling.

Under overseas systems of grading dependent upon appearance and test weight, "bleached" wheat is graded lower than corresponding samples which escape the rain. A similar attitude is adopted in accepting wheat in Australia,

and, although lightly bran-bleached wheat is allowed to mix with f.a.q. wheat, grain whose bushel weight falls below a certain minimum is segregated and a dockage imposed.

Segregation and dockage of bleached and sprouted wheat is undoubtedly justified. Segregation of bleached, but apparently unsprouted, wheat is desirable so that it may be used intelligently, but the imposition of a dockage on such wheat is, perhaps, debatable. The justification for such a dockage would be the cost of segregation, or the possibility that a proportion of the grain had germinated or sprouted and had not been detected by inspection.

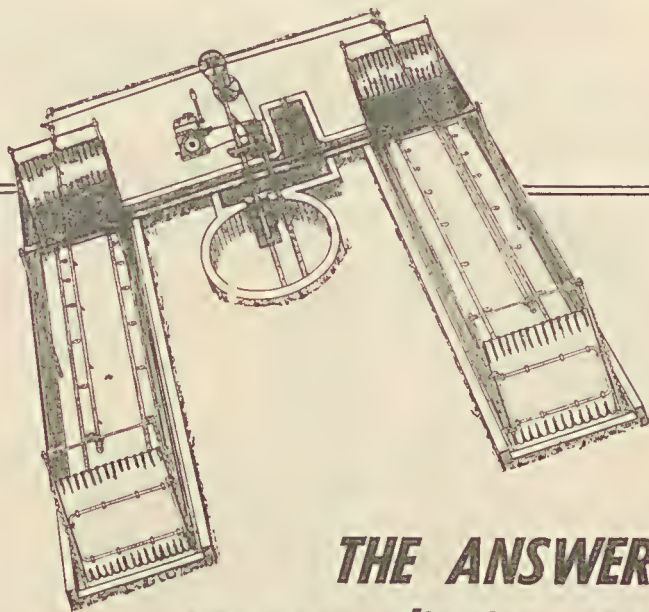
Sprouting of unharvested wheat is unusual under local climatic conditions and, in any case, the presence of a small proportion of sprouted grain in Victorian mill feeds would be advantageous. The chance of having a significant percentage of sprouted grain not observable to the eye, even in badly-bleached wheat, is so remote that the advantages of better-baking quality obtainable from such wheat should not be overlooked.

Early in the year, millers are frequently concerned about lack of maturity in their baker's flour, and the use of bleached wheat would be of assistance to those millers whose carry-over of old wheat or flour is insufficient to allow a gradual change-over from old to new flour.

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BURNLEY EGG-LAYING COMPETITION, 1947-48

By M. D. HALL, Poultry Expert

THE thirty-seventh egg-laying competition for fowls, conducted at the School of Primary Agriculture and Horticulture, Burnley, commenced on 1st April, 1947, and concluded on 1st March, 1948, a period of 48 weeks.

In this competition, the best performance was that of a White Leghorn entered in the dry-mash class by Mr. Paul Nemet. This bird laid 296 eggs, all first-grade, the highest score in all classes of the competition. This competitor was also awarded the Burnley Champion Sash.

Good scores were also recorded by the winning White Leghorn entered by Kingsley Park Poultry Farm in the wet-mash class.

This bird laid 287 first-grade eggs. A Rhode Island Red, owned by Mr. W. M. Wakeham, laid 280 first-grade eggs.

An Australorp entered by Napier Poultry Farm laid 256 first-grade eggs, and a Langshan entered by Mr. J. Lang laid 238 eggs, all first-grade.

Another outstanding performance was put up by a Rhode Island Red owned by Mr. A. J. Collins. This bird gained second prize in Class 5, wet-mash section, with a score of 271 first-grade eggs. Another Rhode Island Red, owned by Mr. Collins, finished in fourth place in this section with a score of 258 eggs. Rhode Island Reds this year maintained their popularity. Thirty-four birds were entered, two more than in the previous competition.

The mortality among competing birds was 5.5 per cent.



The leading bird in the competition, this White Leghorn, owned by Mr. P. Nemet, laid 296 first-grade eggs.

Large numbers of entries were received for the 1948-49 competition, but, as these numbers were in excess of the accommodation available, a ballot had to be conducted.

Breeders are urged to take particular care in the selection of their competition birds, as it is the desire of the Department of Agriculture to accept birds for competition conforming with all the accepted standards of a breed.

The Burnley Egg-laying Competition has achieved an enviable reputation throughout Australia and overseas, and this is due largely to the ability of Victorian poultry breeders and also to the work of the former curator of the Burnley Competition, Mr. J. Macauley, whose knowledge



Left.—Mr. R. A. Murdock's Australorp which won the wet-mash section for Australorps with a total of 256 first-grade eggs. Right.—The winner of the wet-mash section, this White Leghorn owned by Mr. G. J. Teitz (Kingsley Park Poultry Farm) laid 287 first-grade eggs.

and judgement were of great assistance to both competitors and breeders during his long service with the Department

The Burnley Egg-laying Competition is the Victorian poultry farmers' shop window for utility breeds. This should be borne in mind by breeders when selecting their birds for the competition.

Prize certificates and sashes were awarded the owners of birds laying the greatest number of first-grade eggs. During the first two months of the competition, a first-grade egg must weigh not less than $1\frac{3}{4}$ oz.; thereafter not less than 2 oz. At Burnley, every egg is weighed to one-tenth of an ounce. The records are available for examination by any competitor.

AVERAGE EGG PRODUCTION

There were 236 fowls at the commencement of this year's competition, but 13 died during the course of the year. These birds took part in the contest for an aggregate of 2,901 days, which is equal to 9 birds competing for the whole period and 4 taking no part at all. Hence the total number of birds taking part for the whole period of the competition has been regarded as 232 for statistical purposes.

The total number of eggs laid, including those underweight, was 47,971, an average per bird slightly in excess of 206 for 48 weeks.

TABLE OF MONTHLY LAYING RETURNS—1947-1948.

Month.	Light Breeds.						Heavy Breeds.					
	White Leghorns.			Other Light Breeds.			Australorps.			Other Heavy Breeds.		
	Average No. of Birds.	Total.	Average.	Average No. of Birds.	Total.	Average.	Average No. of Birds.	Total.	Average.	Average No. of Birds.	Total.	Average.
April	126	1,902	15.1	8	68	8.5	60	910	15.2	42	673	16.0
May	126	1,865	14.8	8	60	7.5	60	1,085	18.1	42	642	15.3
June	125	1,854	14.8	8	58	7.3	60	1,264	21.1	42	586	14.0
July	125	2,151	17.2	8	60	7.5	60	1,287	21.5	42	699	16.6
August	124	2,604	21.0	8	129	16.1	60	1,308	21.8	42	856	20.4
September ..	123	2,866	23.3	8	176	22.0	59	1,262	21.4	42	962	22.6
October	122	2,930	24.0	8	194	24.3	58	1,224	21.1	42	963	22.6
November ..	122	2,769	22.7	8	185	23.1	57	993	17.4	42	873	20.8
December ..	122	2,655	21.8	8	163	21.0	57	914	16.0	42	793	18.9
January	121	2,494	20.6	8	130	16.3	56	831	14.8	42	763	18.2
February and March 1st ..	118	2,270	19.2	8	103	12.9	55	774	14.1	42	618	14.7



First prize winner in Class 5, Rhode Island Red Section. (wet-mash). This hen laid 280 first-grade eggs.



This Langshan owned by Mr. J. Lang, won Class 5 of the competition with a total of 238 eggs, all first-grade.

The prices realized for the eggs averaged a fraction over 2s. per dozen, while the market value of the eggs averaged £1 13s. 7½d. per bird. The prices received for the eggs, however, are the net prices exclusive of freight, commission, and other charges.

It must be remembered also that the eggs were laid by pullets in their first period of production under conditions entirely different from those on commercial farms where birds of various ages are kept in large flocks.

STATEMENT SHOWING THE NUMBER OF EGGS LAID BY THE VARIOUS BREEDS IN THE COMPETITION, AND THE AVERAGE NUMBER OF EGGS LAID PER BIRD.

Breeds.	Number of Birds After Allowing for Deaths.	Eggs Laid.			Average Number of Eggs Laid per Bird.		
		First Grade.	Under- weight.	Total.	First Grade.	Under- weight.	Total.
LIGHT BREEDS—							
White Leghorns—Wet Mash	76	15,825	649	16,474	208.2	8.6	216.8
White Leghorns—Dry Mash	47	9,656	230	9,886	205.4	4.9	210.3
Other Light Breeds—Dry Mash	8	1,185	146	1,331	148.1	18.3	166.4
TOTAL LIGHT BREEDS	131	26,666	1,025	27,691	203.6	7.8	211.4
HEAVY BREEDS—							
Australorps—Wet Mash	59	11,192	660	11,852	189.7	11.2	200.9
Rhode Island Reds—Wet Mash	34	6,359	683	7,042	187.0	20.1	207.1
Other Heavy Breeds—Wet Mash	8	1,350	36	1,386	168.8	4.5	173.3
TOTAL HEAVY BREEDS	101	18,901	1,379	20,280	187.1	13.7	200.8
TOTAL ALL BREEDS	232	45,567	2,404	47,971	196.4	10.4	206.8

PRIZE LIST, BURNLEY EGG-LAYING COMPETITION, 1947-48

SINGLE TEST

Pen No.	Name and Address.	Total Eggs.	Under-weight.	First Grade Eggs.
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Class 1.—White Leghorns—Wet-Mash.

FIRST PRIZE—CHAMPION CERTIFICATE, ALSO THIRD PRIZE BURNLEY SASH.

177	Kingsley Park Poultry Farm (G. J. Teitz), Kingsley-crescent, Mont Albert, E.10	293	6	287
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SECOND PRIZE—GOVERNMENT CERTIFICATE.

176	J. Smythe, Drouin-road, Longwarry	285	2	283
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THIRD PRIZE—GOVERNMENT CERTIFICATE.

182	L. J. Thornton, Chambers-road, Brooklyn	260	..	260
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Class 2.—White Leghorns—Dry-Mash.

FIRST PRIZE—CHAMPION CERTIFICATE, ALSO BURNLEY CHAMPION SASH.

224	Paul Nemet, Springvale-road, Springvale South	298	2	296
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SECOND PRIZE—GOVERNMENT CERTIFICATE, ALSO SECOND PRIZE—BURNLEY SASH.

234	A. A. Skinner, 75 Vincent-street, Sandringham	292	..	292
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THIRD PRIZE—GOVERNMENT CERTIFICATE.

199	F. G. Fereday, 4 Ross-street, Northcote	281	1	280
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Class 4.—Australorps—Wet-Mash.

FIRST PRIZE—CHAMPION CERTIFICATE.

34	Napier Poultry Farm (R. A. Murdock), Eaglehawk	257	1	256
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SECOND PRIZE—GOVERNMENT CERTIFICATE.

50	T. P. Sweeney, 61 Rundle-street, Ararat	262	11	251
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THIRD PRIZE—GOVERNMENT CERTIFICATE.

53	R. A. Waugh, Lockwood-road, Kangaroo Flat	249	..	249
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Class 5.—All Heavy Breeds, other than Australorps and Rhode Island Reds—Wet-Mash.

FIRST PRIZE—CHAMPION CERTIFICATE.

67	Lang, 46 Dundas-street, Thornbury, N.17, (Langshan)	238	..	238
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SECOND PRIZE—GOVERNMENT CERTIFICATE.

65	D. Granter, 163 Martin-street, Garden Vale, S.4, (White Wyandotte)	228	6	222
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As only two birds laid more than 220 first-grade eggs, first and second prizes only were awarded.

Class 5.—Rhode Island Reds—Wet-Mash.

FIRST PRIZE—CHAMPION CERTIFICATE.

97	W. M. Wakeham, 20 Frederick-street, Heidelberg	281	1	280
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SECOND PRIZE—GOVERNMENT CERTIFICATE.

73	A. J. Collins, Old Beacons-field-road, Emerald	272	1	271
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THIRD PRIZE—GOVERNMENT CERTIFICATE.

100	Rivington Poultry Farm (F. R. Walton), Woodvale-road, Boronia	265	..	265
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**FIRST CLASS CERTIFICATES OF MERIT TO OWNERS OF HENS IN CLASSES 1, 2, AND 4 WHICH LAID
240 FIRST-GRADE EGGS, AND IN CLASS 5 WHICH LAID 220 FIRST-GRADE EGGS.**

Pen.	Name and Address.	First Grade Eggs.	Pen.	Name and Address.	First Grade Eggs.
Class 1.—White Leghorns—Wet-Mash.			Class 2.—White Leghorns—Dry-Mash.		
166	W. C. Robertson, 3 Claremont-avenue, Newtown	256	192	W. H. Clements, 7 Crown-road, Ivanhoe	260
183	Mrs. F. Waugh, Cemetery-road, Kangaroo Flat	254	216	J. R. Maddison, Red Cliffs, Post Office ..	260
134	L. Hayter, Haven, via Horsham ..	253	191	W. H. Clements, 7 Crown-road, Ivanhoe	257
135	W. Hedgecock, 12 Pearce-street, Yarra- ville, W.13	253	228	Miss A. Roberts, "Range View," Launching Place	256
180	Corryong Poultry Farm (A. L. Thomas), Sellars-street, Greensborough	253	231	J. Robertson, Princes-street, Ararat ..	256
126	A. G. Fraser, Box 39, Horsham ..	252	213	G. A. McLeod, 4 Bletchley-road, Oakleigh	253
132	Boomerang Stock (H. G. Harvey), 78 Alexander-street, Footscray	252	222	G. Moran, Glenburnie-road, Mitcham ..	252
175	J. Smythe, Drouin-road, Longwarry ..	252	208	G. McDonnell, 46 Childers-street, Kew, E.4	248
178	Kingsley Park Poultry Farm (G. J. Teitz), 21 Kingsley-crescent, Mont Al- bert, E.10	252	210	K. C. McKenzie, 82 Clarence-street, Geelong West	248
128	Goddard and Harvey, Creek-street, off Shamrock-street, Bendigo	250	220	V. R. Milligan, S.S. 3732, Ballendella, via Rochester	247
150	L. J. Flynn, 85 McKenzie-street, Won- thaggi	249	214	G. A. McLeod, 4 Bletchley-road, Oakleigh	241
115	W. J. Bradshaw and Son, Valley-road, Highton	248	Class 4.—Australorps—Wet-Mash.		
149	L. J. Flynn, 85 McKenzie-street, Won- thaggi	247	47	H. O. Stehn, 41 Cornell-street, Burwood, E.13	248
156	John Mitchell, 322 Cotham-road, Kew ..	245	40	H. E. Rouse, Middleboro-road, Box Hill	247
127	Goddard and Harvey, Creek-street, off Shamrock-street, Bendigo	244	48	H. O. Stehn, 41 Cornell-street, Burwood, E.13	247
122	A. R. Davey and Son, Sellars-street, Greensborough	243	9	R. E. Eeles, McIvor-road, Bendigo ..	246
130	The Haven Stud Poultry Farm (E. W. and E. K. Grosvenor), Springvale-road, Springvale South	241	18	E. A. Head, 38 Serrell-street, East Mal- vern, S.E.5	245
161	J. Rasmussen, Moorabbin-road, Chelten- ham, S.22	240	Class 5.—Rhode Island Reds—Wet-Mash.		
			74	A. J. Collins, Old Beaconsfield-road, Emerald	258
			90	Combe Martin Poultry Farm (W. Linter- mans), Major-road, Lysterfield	252
			92	Milledge Bros., 24 McKinley-street, Echuca	250
			70	C. E. Buckley, 7 Mary-street, Werribee	246
			87	E. J. Ikin, 44 McKay-street, Seddon, W.13	239
			86	H. G. Hirons, 21 Bryson-street, Canter- bury, E.7	229
			88	E. J. Ikin, 44 McKay-street, Seddon, W.13	221



VICTORIAN F.A.Q. WHEAT

Analysis of 1948 Sample

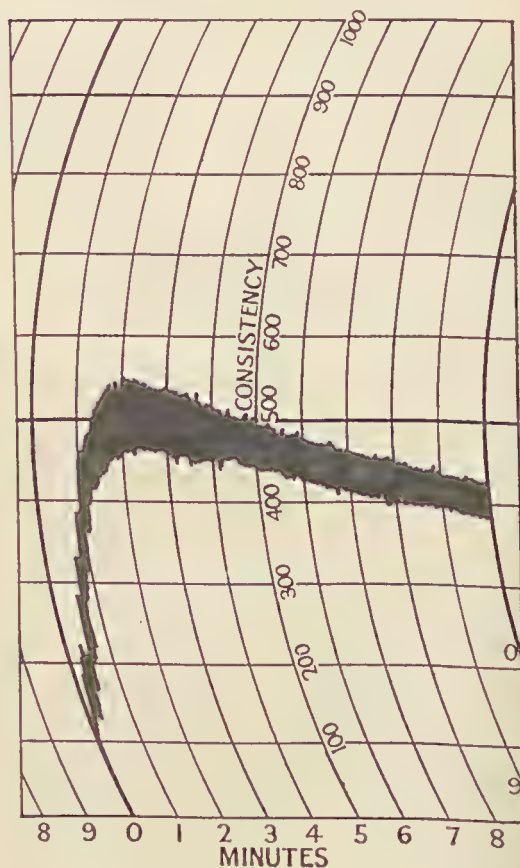
By E. J. O'BRIEN, A.A.C.I., Cereal Chemist

The milling and baking properties of the Victorian wheat crop, as indicated by the analysis of a single composite sample, is compared with those of the previous seven years in the following tables. The sample analysed was a representative part of the official F.A.Q. wheat sample for 1948, and was made available by the Victorian Chamber of Commerce. The official sample represented a Victorian wheat crop of approximately 42 million bushels, and was composed of 280 individual samples from all districts, mixed in the following proportions:—Mallee 31 per cent.; Wimmera 36 per cent.; Northern 13 per cent.; North-east 17 per cent.; South-central 3 per cent.

WHEAT

The colour is bright, but pale, soft grains predominate, and the darker grains are pinched and shrivelled. The presence of this small amount of shrivelled grain is due to the effects of rust which, while not affecting all crops to the same extent, caused a serious reduction in yield over the whole State, and caused the F.A.Q. bushel weight to be struck at $60\frac{1}{2}$ lb., which is lower than usual. The amount of impurities is relatively high, but this includes 3 per cent. small grain of less than 2 mm. diameter.

The analysis of the weed seeds present in the sample disclosed the presence of thirteen different weeds, of which three—Saffron thistle, Long-fruited wild turnip, and Onion weed—are declared prohibited weeds. None of the weed seeds present are objectionable from a milling point of view, since they are few in number, do not impart a taint to the wheat, and are readily removed by orthodox cleaning machinery. However, prohibited weeds can be readily spread through a common medium such as wheat, and their presence indicates either bad farming methods or serious contamination of some wheat areas; either alternative is of interest to farmers, in whose hands the remedy lies.



Farinogram of 1948 Sample of F.A.Q. Wheat.

The quantity of protein is lower than that of the preceding years, but its quality is somewhat better, as shown by practically the same Pelshenke figure.

FLOUR

The cleaned, conditioned wheat milled readily to yield a normal quantity of bright flour, with the usual low ash content.

The diastatic activity, as measured by maltose figure and gassing power, is low and, as is usually the case with Victorian flour, is inadequate for satisfactory bread production. Malt flour additions will have to be made by bakers to remedy this defect.

The protein content is low, but when the gluten is determined by the dough-washing method, the results are higher than would be expected. This indicates good gluten quality, and the Farinograph data confirms the better gluten quality as compared with the 1942 sample, with which the results may be compared in the tables. The lower water absorption for this year is due to less protein, and indicates that bakers will need to reduce the amount of water added to doughs or very slack doughs will result.

The Farinograph also shows that the mixing time, to achieve maximum consistency, is less than for last year, and, although the curve shows reasonable tolerance, the best bread will be produced by reducing the mixing time.

Baking results were better than would be expected from the protein content; good volumes were achieved with the addition of malt flour, phosphate, and bromate, but the doughs lacked strength, and fermentation tolerance was short. The crumb structure was fair and staling was not rapid, provided the doughs were taken slightly green.

Although these results refer to only one sample and millers will get a range of quality on both sides of the F.A.Q. sample, they show that, while the protein level is low, it is counterbalanced to some extent by improved protein quality. However, bakers will need to appreciate the limitations of this season's flour and use the flour to advantage by adding malt flour, mixing their doughs firm and not extending the fermentation time.

TABLE 1.—ANALYTICAL RESULTS—WHEAT.

	1941.	1942.	1943.	1944.	1945.	1946.	1947.	1948.
Moisture (per cent.) ..	11.0	10.5	11.2	11.2	11.8	11.7	11.2	11.6
Impurities (screenings) (per cent.) ..	3.8	5.3	3.7	4.9	4.1	4.7	3.9	5.9
Ash (per cent.) ..	1.20	1.23	1.20	1.20	1.19	1.36	1.22	1.22
Protein (N x 5.7 per cent.) ..	11.7	10.3	11.1	10.4	11.5	11.8	11.2	9.8
Bushel weight (lb.) ..	64½	63½	64½	65	63½	62½	63½	60½
Pelshenko figure (min.) ..	39	32	33	37	35	32	38	36

TABLE 2.—ANALYTICAL RESULTS—FLOUR.

	1941.	1942.	1943.	1944.	1945.	1946.	1947.	1948.
Moisture (per cent.) ..	12.4	13.2	13.6	13.4	13.4	14.0	13.5	14.4
Yield (per cent.) ..	73.2	70.0	71.7	70.0	72.0	70.3	70.3	70.0
Ash (per cent.) ..	0.47	0.48	0.46	0.40	0.44	0.43	0.41	0.40
Protein (N x 5.7) (per cent.) ..	10.4	9.0	10.0	9.0	10.3	10.5	9.5	8.2
Wet Gluten (per cent.) ..	30.8	25.7	30.0	28.0	35.0	31.3	31.7	28.1
Dry Gluten (per cent.) ..	10.4	8.6	10.1	9.4	10.9	10.3	9.8	9.3
Water Absorption (Farinograph) (per cent.) ..	61.8	57.5	57.5	55.4	59.6	60.0	57.0	53.0
Valorimeter No. (Farinograph) ..	44	38	39	39	38	38	40	40
Maltose Figure (mgrms. Maltose per 10 gms.) ..	152	142	110	108	107	111	93	80
Gassing Power (cc. per 100 grms. flour in 5 hours) ..	..	..	..	..	..	820	680	545

TABLE 3.—STANDARD BAKING TESTS (100 GRM. FLOUR)—LOAF VOLUME IN C.C.

Formula.	1941.	1942.	1943.	1944.	1945.	1946.	1947.	1948.
Basic ..	442	440	440	405	425	477	450	440
Basic + malt + phosphate ..	517	475	490	475	494	550	510	510
Basic + malt + phosphate + bromate ..	561	460	505	515	592	555	540	555

The Production of New Cereal Varieties

By H. J. SIMS, M.Agr.Sc., B.Com., Cerealist

IN the course of the judging of wheat crop competitions, farmers often seek information concerning the production of new varieties and for their information and as a matter of general interest, the following notes have been prepared.

There are two general methods by which new varieties are produced; namely by selection and by crossbreeding.

When a plant is produced by selection the starting point is the selection of an outstanding plant from an existing variety. Such plants are grown in single rows and kept under continual observation and compared with the parent variety. If a selection appears better than the parent, supplies of seed are built up for yield testing, and should it prove satisfactory under these tests it can be named as a new variety. It was by these methods that Pindar and Pinnacle were produced. Pindar is a selection from Ghurka, and Pinnacle is a further selection from Pindar. Likewise, Algeribee oats is a selection from Algerian.

The most commonly used method to produce varieties is that of crossbreeding; as by that means, the desirable characters of several strains may be combined in one variety.

The cross-breeding of wheats is a delicate process and considerable experience and knowledge of the structure of the wheat flower and wheat head are required for successful work. Briefly the process consists of removing the pollen sacs before they are ripe from a number of flowers on a selected head of wheat. Normally about a dozen flowers on the head are so treated and the remainder of flowers on the head are stripped off. The head is then wrapped in cotton wool or cellophane to protect it from windblown pollen, and to await the time when the flowers (from which the pollen sacs were removed) are ready or ripe to receive pollen. When this occurs, the cotton wool is removed and ripe anthers of the particular variety of wheat it is desired to use as a male parent are secured

and pollen from these is dusted into each of the flowers prepared as above, and the head is wrapped up again. In about a fortnight the wrapping can be removed and the ear allowed to ripen.

The cross-fertilized seed is sown the next season in single rows and each plant is harvested separately. Next year, the grain from each plant is sown in a separate row again. During this generation the rows show great variation in appearance due to segregation and recombination of the various characters conveyed to the cross by the two parents. It is at this stage that the plant breeder selects the types of plants he desires. The plants selected are again sown in single rows, and selection is continued until such time as the rows showing the desired characteristics breed true, i.e. show no signs of further segregation. Such fixing may take three or four years.

The next stage is to build up the seed of the fixed crossbred material and subject it to testing for yielding ability, grain quality, disease resistance, and agricultural characteristics which include strength of straw, ease of harvesting, tendency to shake, &c.

It will thus be seen that the production of a new variety is a laborious and tedious process. Following its production a considerable amount of testing is also necessary before it can be released. For example, the original cross that produced Insignia was made in 1933. This cross was between Ghurka and Rance 4H. The crossbred material was grown in rows and selected until 1938, and small plots were sown in 1939. It was promoted to large plots in 1940, and tested against standard varieties until 1945. During this period also, owing to its promise, seed supplies were being built up and in March, 1946, the Wheat Advisory Committee agreed that the variety be named. Thus 12½ years elapsed between the time the cross was made and the variety was named. Frequently an even longer period of testing is necessary.

Warracknabeal Wheat Crop Competition 1947

REPORT of the JUDGE,

H. J. SIMS, M.Agr.Sc., B.Com., Cerealist



Harvesting a heavy crop of wheat in the Wimmera.

IN the northern Wimmera, the 1947 season opened with promise; but, before the crops were harvested, growers experienced several anxious periods.

Owing to the light rainfall received during the spring of 1946, the fallows did not have their usual early preparation. Good autumn rains, however, enabled several cultivations to be made and these killed germinating weeds. Rains in May and early June were rather light and patchy, but were sufficient for many farmers to start sowing. July was very wet, rain being recorded on 21 days, and sowing on many properties was prolonged on this account. Good rains were received in the spring, and, at that time, there were expectations of record yields. The occurrence in the spring of

the diseases deadheads and rust caused serious concern—as it was not certain to what extent these would reduce the yield. However, final yields were higher than the average experienced over the past ten years, and the grain sample in general was better than that obtained in many other districts.

The winning crop in the competition was estimated to yield approximately 40 bushels per acre, while the 27 crops inspected were expected to return an average yield of approximately 9½ bags per acre.

One thousand six hundred and seventy-four points of rain fell in 1946, 1,344 in 1945, and 807 in 1944. Rainfall at Warracknabeal over the past 74 years has averaged 1,507 points.

RAINFALL AT WARRACKNABEAL, 1947.

Month.	Rainfall.	Number of Falls.
	Points.	
January	20	1
February	89	6
March	223	12
April	66	7
May	54	4
June	186	14
July	235	21
August	170	15
September	181	9
October	294	15
November	165	6
December	186	7
Total	1,869	117

WHEAT VARIETIES

Five wheat varieties were represented in the competition entries. Details of the varieties grown are :—

Variety.	Number of Crops.	
	Whole Entry.	Part Entry.
Quadrat	17	3
Pinnacle	2	2
Ghurka	2	..
Diadem	..	4
Magnet	..	3

Quadrat has been the most popular variety in the past two competitions. This variety, since its release by the Department of

Agriculture seven years ago, has proved its all round usefulness as a farmer's wheat, and it seems that it will occupy a leading position for some time to come. This year, its popularity has been still further increased as it showed less rust than other varieties grown in the district.

Pinnacle, a variety released for sowing at the beginning of 1946, is being watched with interest. Its head is not as bold as that of *Quadrat*, and its yields are often better than anticipated. The flour gluten quality is superior to that of *Quadrat*.

Ghurka, which was named over twenty years ago, has been a standard wheat in the Wimmera for many years, but it has now given pride of place to *Quadrat*. However, many of the desirable characteristics possessed by *Quadrat* have been inherited from *Ghurka*—one of its parents.

Diadem was released for sowing last season, and several promising crops were inspected. This variety combines good-yielding ability with grain quality superior to standard Wimmera wheats. This year, owing probably to climatic conditions, the protein quantity of much of the Victorian wheat is lower than usual, and this lower protein quantity may lead to disappointing reports concerning this variety. However, experience has shown that, unless protein quantity is above a certain minimum, differences in protein quality may not be apparent.

Magnet, the other variety grown by competitors, is a taller-growing and later-maturing variety, and usually does well in



Cereal experimental plots in the Wimmera.



Scarifying a Wimmera fallow.

those years with a late finish. Because of its taller straw, it is often favoured as a hay wheat, or where weed competition is feared. Magnet has proved a high-yielding variety throughout most of the Wimmera.

PURITY AND TYPE

There are two types of impurities normally found in wheat crops. The first type is the presence of heads of foreign varieties. Grain of the foreign variety can become mixed with the variety grown through inadequate cleaning of machinery at sowing time, and harvest time, or when the seed is graded and pickled.

The second type of impurity is the presence of off-type heads throughout the crop. Such off-type heads may be "whiskered" heads; heads of the same type as the variety grown, but of a different colour, for example, white types in Quadrats or Pinnacles; taller plants and long thin heads tough to thresh. Such off types are due to natural variation and mutation (changes within the plant), or to natural crossing. At the Research Stations and Agricultural Colleges, attention is given to the elimination of these off types in the production of seed wheat.

The most common impurities present in the crops inspected were heads of foreign varieties, namely, Quadrats could be

seen in Magnet crops, while heads of Magnet, Bencubbin, and Turvey were found in the Quadrats crops. Many competitors considered most of the impurities were introduced in the grading of their wheat. The grading is normally done by contract, and the operator is paid on a piecework basis, and no allowance is made in the charge for the cleaning of the grading machine. Many competitors considered it would be worth while to pay an extra amount to have the grader properly cleaned out after each variety is graded.

WEEDS

Weed control is undoubtedly one of the main problems in wheat growing, and is one of the most important reasons for fallowing—in that the control of weeds on the fallows allows the maximum conservation of moisture.

Wild oats were present to a varying extent in most crops; and certainly were present to a much greater extent than usual. Probably the wet-sowing conditions, and the difficulty of killing the wild oat seedlings then, was the reason for their abundance. Other weeds, including iron weed, mustard, and poppies were present in many crops, but not in serious proportions.

DISEASES

The diseases noticed in the crops were rust, deadheads, and three types of smut.

Rust

Rust is caused by a fungous organism, which can attack all above ground parts of the plant, but is most destructive when the stems are affected. The fungus is usually carried from year to year on self-sown wheat plants—thus rust is usually worst in a spring following heavy late summer and autumn rains. Also, spore material can be blown long distances to set up the primary infection in a district. After the infection with spores takes place, the weather conditions determine the extent of the spread of rust. If the weather is cool or dry, little if any, visible damage is done; but, should warm muggy weather with frequent showers be experienced, the disease can develop with extraordinary rapidity; and damage a potentially heavy crop very quickly. It was fortunate for the Warracknabeal farmers that rust was not as severe in their district as in some other districts.

Deadheads

Deadheads were noticed in many competition crops, but seldom in sufficient numbers to materially reduce the yield. However, some crops were inspected where the yield would be considerably reduced by the trouble.

Deadheads are caused by several fungous diseases that grow at the base of the stems and on the roots of wheat and other plants, including barley grass. These fungous organisms are present in most crops every year, but it is only in some years that they do much damage. The damage has been found to be most severe in those years with wet weather conditions in the spring.

The effect of the fungus is to infect the roots, and so restrict their growth. Thus the roots are unable to supply the requirements of the plant at a critical time. Some plants die when small, but the majority die at various times after the plant comes into head.

Apparently in a wet spring the plant makes vigorous succulent growth, and, if a warm spell is experienced, the infected

roots cannot supply enough moisture to keep this growth going, and the plants die. It will be found that the "deadheads" are much more easily pulled from the ground than unaffected plants—thus demonstrating the limited root growth of the affected plants.

The control of deadheads is not easy. As there are several different types of organism causing the dead-head symptoms, little progress has been made in the production of a variety resistant to the various organisms. The spelling of land in grass may increase the disease instead of serving as a control measure. It is regarded as good practice to use oats as a rotation crop, as oats are resistant to the attack of some of the organisms causing the "deadhead" symptoms. However, the increase of mechanised farming has decreased the area sown to oats for hay.

The only methods that can be suggested to control deadheads are summed up in the words "good farming". This means good fallowing to kill barley grass and to conserve moisture, and the adequate application of plant foods. Superphosphate is the most important of the plant foods, but zinc sulphate may be important on some soil types, more especially in the wetter years.

Smut

A small amount of each of the three types of smut were found. Odd plants affected with flag smut were present in two crops. The use of resistant varieties has certainly given satisfactory control of this type of smut. Loose smut or blow smut was found in small amounts in most crops. As the spores of this smut are carried inside the grain, it cannot be controlled by pickling. If a crop is badly infected, steps should be taken to obtain seed from a clean crop.

The third type of smut is bunt or ball smut. This is the disease it is aimed to control when wheat is pickled. The presence of odd bunted plants in five crops indicate that, while the disease would cause no economic loss in these crops, constant attention is necessary; if pickling is not properly carried out, serious infection could result.

COMPETITION CROPS

The competition was divided into three sections:—

- (a) Open crop competition;
- (b) Aggregate section, heavy land;
- (c) Aggregate section, light land.

Before considering the section winners, some statistical data concerning the crops entered may be of interest. Data with respect to varieties has already been given. The seeding rate adopted by competitors varied from 60 to 85 lb. per acre. The average seeding rate on heavy land (73 lb. per acre) was slightly higher than that on the light land (69 lb. per acre).

On the other hand, the superphosphate dressing was slightly heavier on the light land. The range used on light land was 60 to 90 lb. per acre, averaging 74 lb., while on heavy land, the range was 40 to 112 lb. with an average of 68 lb. per acre.

Twenty-two of the competitors pickled their seed with copper carbonate, while the remaining five used a red mercury pickle. Formalin was used by one competitor to pickle his small quantity of Diadem seed.

The sowing of the crops was spread over the period from the beginning of June until the third week in July. In general, those crops sown during the first three weeks in June appeared to be better yielding than those sown later.

Rotations used by some competitors were upset in the drought years, but about two-thirds of the land was worked on a fallow-crop basis. The remainder were using a three-course rotation of fallow-wheat-oats or fallow-wheat-grass.

OPEN SECTION

The best crop in the competition was shown in the open section. It was a heavy crop of Magnet and Diadem shown by Mr. W. G. Rodda, of Aubrey. The crop was moderately tall, well headed, and dense, and was expected to yield approximately 40 bushels per acre.

The land on which this crop was grown was formerly cropped on a two-course rotation, but latterly this has been widened to a three-course of fallow-wheat-oats. The fallow was prepared with a disc at the end of July, self-sown oats 6 inches tall being ploughed in. The paddock was harrowed once before harvest, and twice after, was scarified at the end of March, and was sown when the soil was rather dry about the middle of June (just before rain). The seeding rate was 75 lb. per acre, while 100 lb. of superphosphate per acre was applied. The purity of the Diadem was very good, but unfortunately, during a mouse plague, and due to the necessity to shift the seed in the barn, a bag of Quadrat was placed with the Magnet, and a strip of Quadrat was sown with the Magnet—thus causing a loss of points.



Visitors listening to an address at a Farmers' Field Day held at Warracknabeal last year.

Second place was gained by Mr. R. O. Gould, with a dense crop of Quadrat, which was not as well headed as the winning crop. This crop also had more wild oats than the winning crop.

Mr. Gould's fallow had been disc ploughed in March, 1946, scarified in July and November, springtoothed in February, and again in April, and was sown on 20th July with 70 lb. of seed and 70 lb. of superphosphate per acre.

AGGREGATE SECTION, HEAVY LAND

Mr. W. S. Schneider won the Aggregate Section, heavy land. At the autumn judging this competitor's fallow was placed equal first. Although Mr. R. O. Gould and Messrs. F. and A. Symes received more points for their crops, Mr. Schneider's margin in the fallow enabled him to win this aggregate section. The variety sown was Quadrat; the crop fairly tall, dense, and well headed. The fallow had been ploughed in March, 1946, harrowed in April, shear-harrowed in August, harrowed in December and again in February, and worked with the spring-type shear harrows in April. It was sown with 75 lb. of seed and 54 lb. of superphosphate during the last week in June.

Mr. R. O. Gould's entry was second in this section and the same crop that gained second place in the Open Section.

AGGREGATE SECTION, LIGHT LAND

Mr. L. J. Johns, who won the Aggregate Section (light land), submitted a crop of Quadrat grown on heavy Mallee land. This crop was medium, tall, reasonably well headed, with the heads filling fairly well. Mr. Johns's fallow won the light-land fallow competition. It had been scarified early in June, 1946, harrowed in July, scarified in September, combined in February, shear-harrowed early in April, and combined (with cover harrows) on 12th July. The rates of seed and superphosphate were 75 lb. and 80 lb. per acre respectively.

Mr. A. L. McLean's entry of Pinnacle and Diadem was placed second. The Diadem appeared to be the heavier crop. It was grown on a heavy Mallee flat, while the Pinnacle was grown on rising land. The purity of both crops was good.

The fallow was prepared with a skeleton mouldboard in September, 1946, and was not worked again until February, when it was scarified. It was springtoothed in May and again in the third week in June and was sown on 18th to 20th July with 60 lb. of copper carbonate pickled seed and 70 lb. of superphosphate per acre.

AWARDS, OPEN SECTION, WARRACKNABEAL WHEAT CROP COMPETITION, 1947 (Best 50 Acres.)

Competitor.	Variety.	Yield.	Purity and Type.	Absence of—		Evenness.	Total.
				Weeds.	Disease.		
Maximum Points ..	..	35	20	15	15	15	100
W. G. Rodda ..	Magnet and Diadem	35	17½	14½	12	14	93
R. O. Gould ..	Quadrat	33	18	13	14	14	92
N. E. Hewitt ..	Quadrat	34	18	12½	14	13	91½
F. W. Graetz ..	Quadrat	30	18½	14	14	14	90½
E. A. Haeusler ..	Quadrat	29	18½	14	14	14	89½
W. A. Hewitt ..	Quadrat	29	18	14	13½	13½	88
R. Lehmann ..	Pinnacle	26	19½	14	14	14	87½
P. A. Lehmann ..	Quadrat	27	18	14	14	14	87
A. S. Rodda ..	Quadrat and Magnet	27	18½	13½	12½	14	85½
A. L. McLean ..	Pinnacle and Diadem	22	19	13½	14	13½	82

AWARDS, AGGREGATE SECTION (HEAVY LAND), WARRACKNABEAL WHEAT FALLOW
AND CROP COMPETITION, 1947.

(Best 50 Acres.)

Competitor.	Variety.	Yield.	Purity and Type.	Absence of—		Evenness.	Crop Total.	Fallow Total.	Aggregate.
				Weeds.	Disease.				
Maximum Points ..	..	35	20	15	15	15	100	100	200
W. S. Schneider	Quadrat ..	32	18	13½	14	14	91½	99	190½
R. O. Gould ..	Quadrat ..	33	18	13	14	14	92	98	190
F. and A. Symes	Ghurka ..	32½	18	13½	14	14	92	93½	185½
W. A. Hewitt..	Quadrat ..	30½	18	13½	14	14	90	95	185
R. Lehmann ..	Pinnacle ..	26	19½	14	14	14	87½	97	184½
W. and E. Holland, No.1	Quadrat ..	30	18	14	12½	14	88½	95½	184
P. A. Lehmann	Quadrat ..	27	18	14	14	14	87	97	184
W. and E. Holland No.2	Quadrat and Magnet	25	18	13½	14	14	84½	95	179½
E. and L. Hewitt	Quadrat ..	23	18	13	14	12½	80½	99	179½
O. P. Pietsch and Son	Pinnacle and Diadem	26	19	12½	13½	13	84	95	179
E. A. Haeusler	Quadrat ..	24	18½	14	14	13½	84	94½	178½
A. S. Rodda ..	Diadem and Quadrat	25	19	13½	13½	14	85	93½	178½
H. J. Bunge and Sons, No. 1	Quadrat ..	24	18½	13	12½	14	82	96	178
A. S. Dart ..	Pinnacle ..	22	19	13	13½	14	81½	96	177½
H. J. Bunge and Sons, No. 2	Quadrat ..	23	18½	13	12½	13½	80½	95½	176
W. Bouchier and Crerar ..	Quadrat ..	24	18	13	13½	13	81½	93½	175
P. A. Gould ..	Crop with- drawn	..	..	..	..	..	..	..	..

The fallow was judged in the Autumn of 1947.

AWARDS, AGGREGATE SECTION (LIGHT LAND), WARRACKNABEAL WHEAT FALLOW
AND CROP COMPETITION, 1947.

(Best 50 Acres.)

Competitor.	Variety.	Yield.	Purity and Type.	Absence of—		Evenness.	Total Crop.	Total- Fallow.	Aggregate.
				Weeds.	Disease.				
Maximum Points ..	..	35	20	15	15	15	100	100	200
L. J. Johns ..	Quadrat ..	22½	18	13½	14	14	82	95½	177½
A. L. McLean	Pinnacle and Diadem	22	19	13½	14	13½	82	93½	175½
M. Johns ..	Quadrat ..	21	18	13	13½	14	79½	93	172½
R. N. Baker ..	Ghurka ..	18	18	12½	14	13	75½	95½	171
A. T. Couzner	Quadrat ..	19½	18	13	14	13	77½	93½	171

The fallow was judged in the Autumn of 1947.

CLASSES FOR WHEAT

ROYAL AGRICULTURAL SHOW, 1948

THE Royal Agricultural Society has announced particulars of the classes for wheat for the next Melbourne Royal Show to be held from 23rd September to 2nd October, 1948.

Eight separate classes for wheatgrowers, with prizes totalling £99, have been included in the schedule. Among these are sections for novice competitors, and for wheatgrowers in particular districts such as the Mallee and the Wimmera.

Of special interest is the new "Sunshine" competition introduced this year for one bushel of wheat grown in any district of Victoria, the variety to be one of the ten commercially-grown wheats, as listed. Prizes amounting to £26 will be awarded in this section.

The Society suggests that intending competitors in the wheat classes should set aside some of their wheat before the seed for the coming crop has all been pickled or sown.

The wheat classes are as follows:—

Novice Class

Baldmin, Bencubbin, Ghurka, Insignia, Magnet, Pindar, Pinnacle, Quadrat, Rancee 4H, or Regalia (one bushel grown in Victoria)—Open to competitors who have not won a first prize for wheat at any previous Melbourne Royal Show—prizes £5, £3, £2, £1.

Mallee District Class

Bencubbin, Ghurka, Insignia, Pindar, Quadrat, Rancee 4H, or Regalia (one bushel) grown in the Counties of Millewa, Weeah, Karkaroor, or Tatchera—prizes £5, £3, £1.

Wimmera District Class

Baldmin, Bencubbin, Ghurka, Insignia, Magnet, Pindar, Pinnacle, Quadrat, or Rancee 4H (one bushel), grown in the Counties of Lowan, Borung, or Kara Kara—prizes £5, £3, £1.

Other Districts Class

Baldmin, Bencubbin, Ghurka, Insignia, Magnet, Pindar, Pinnacle, Quadrat, Rancee 4H, or Regalia (one bushel), grown in any district of Victoria other than those specified above—prizes £5, £3, £1.

Sunshine Wheat Competition—All Victorian Districts

Baldmin, Bencubbin, Ghurka, Insignia, Magnet, Pindar, Pinnacle, Quadrat, Rancee 4H, or Regalia (one bushel), grown in any district of Victoria. To be judged on bushel weight, general appearance, milling and baking quality as determined by chemical and physical tests.

First prize £9 cash and trophy valued at £5, second £6, third £4, fourth £2. (Prize-money totalling £21 and trophy £5 donated by H. V. McKay-Massey Harris Pty. Ltd., Sunshine Harvester Works, Sunshine.)

The following Classes are open to exhibits grown in any district or State:—

Wheat (1 bushel) any Variety

Prizes £5, £3, £1.

Collection of Three Varieties of Wheat—Medium Strong

Baldmin, Celebration, Charter, Dundee, Eureka, Florence, Ford, Gabo, Gular, Hard Federation, Javelin, Koala, Kendee, Minister, Rapier, Scimitar, Sword, Wardfir, Warigo, or Yelta (one bushel of each).

Prizes—£7, £4, £2.

Collection of Three Varieties of Wheat, Other than Strong or Medium-strong (1 bushel of each)

Prizes—£7, £4, £2.

Entry forms and further particulars concerning the wheat classes may be obtained from the Secretary, Royal Agricultural Society, 422 Collins-street, Melbourne, C.I.

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LIVE STOCK NOTES

Compiled by

A. C. T. HEWITT, M.Agr.Sc.,

Live Stock Science Officer



OATS FOR POULTRY

Oats are available in abundant supplies for stock feeding

In Australia, wheat is the recognized basic grain for poultry feeding, but, this year, even though there has been a record wheat harvest, the demand for wheat to help feed the people of Great Britain, Europe, and other countries is so great that the Commonwealth Government has found it necessary to rigidly limit the amount that can be fed to stock. This limit for 1948 is 25 million bushels for Australia, and from this amount the present stock feed quota for Victoria is 561,000 bushels per month.

Of the wheat fed to stock in Victoria it is estimated that more than three-quarters of it is fed to poultry. The production of eggs in Victoria has trebled during the past eight years. It is still increasing rapidly and will continue to expand while profitable prices are paid for eggs, but with short supplies of wheat, bran, and pollard, other foods will have to be used. Oats are the only other poultry food available in quantity and they are undoubtedly a good poultry feed, although poultry farmers here are not accustomed to using them.

In the first feeding trial conducted at the State Research Farm, Werribee, in 1921-22, four pens of birds were fed standard wet mash in the morning, greenstuff, and shellgrit, but each was given a different grain ration in the afternoon. The hens in the pen receiving oats as the only grain laid

an average of nineteen eggs more per bird than the hens receiving wheat. Similar tests in U.S.A. have shown oats to be superior to corn (maize) which is the basic grain fed to fowls in that country.

The results of the Werribee trials are set out in the following table:—

	Average Number of Eggs Laid.
Hens fed oats as the only grain ..	170
Hens fed wheat as the only grain ..	151
Hens fed barley as the only grain ..	144
Hens fed 2 parts wheat, 1 part oats, and 1 part barley	157

The hens receiving mixed grain containing oats also laid better than those receiving either wheat or barley only.

Oats have much more value in poultry rations than has been recognized in recent years according to the results of nine years work at the Ohio Experiment Station, and no advantage has resulted from feeding hulled oats in comparison with whole or ground oats, and it appears that the natural combination of the oat kernel and the hull is best.

On account of the hull, oats are not such a rich food as wheat, and 16 per cent. more grain by weight has to be fed to supply the same number of nutrients. Oats are also a bulkier grain, and if the grain is measured out, very nearly double measure

has to be fed to supply the same number of nutrients. These facts are important, otherwise the hens may be underfed. Comparative prices are also important and the wholesale price of oats at 4s. 3d. per bushel compares very favourably with the price of bagged wheat at 6s. 11d. Oats can be purchased at 4s. 6d. retail ex-store Melbourne, and, at this price, are as cheap as bagged wheat at 7s. 9d. per bushel ex-store.

The conclusions based on the results of American feeding trials with oats are summarized by W. Ray Ewing in his Handbook on Poultry Nutrition, as follows:—

(1) Oats are the best single grain for poultry of those commonly available in the maize belt (this includes maize, wheat, barley, and oats).

(2) Up to 40 per cent. or perhaps even more of the ration of the growing chick, the laying hen, and the turkey may well be made of oats when the quality is good and the price justifies its use.

(3) Chicks fed on a ration high in oats will grow faster and feather more rapidly than on any other common grain.

(4) When laying flocks are fed only one grain, mortality is least with oats.

(5) Whole oats reduce cannibalism and feather picking in growing and laying flocks.

(6) Chicks from hens on a high-oat ration have more vigour than those from hens with a high-maize ration.

(7) Hens will not lay as many eggs if oats are the only grain used as they will if maize is the only grain fed.

(8) A high-oat ration produces chicks with light or no yellow pigment in the beaks and shanks.

(9) Even oats as light as 17 lb. to the bushel may be ground and used successfully in the mash of growing chicks, laying hens or mature turkeys when the amount is limited to 28 per cent. or less.

(10) For fattening rations, oats are far less efficient than maize.

Although oats may be fed as the only grain, it is recommended that as far as possible, oats be used to provide one-third of the grain ration and ground oats, up to 40 per cent. of the mash for adult hens. For small chickens, hulled oats are recommended, but as they grow, ground oats may be added to the mash and increasing proportions of whole oats added to the grain

mixture. It is also desirable to buy good quality oats weighing at least 32 lb. per bushel.
[A.C.T.H.]

“RADIANT HEAT” FOR CHICKENS

“Radiant heat” for the brooding of chickens is increasing in popularity in America. This new system, previously referred to as floor brooding, is now generally known as “radiant heat” and will probably retain that name.

The term “radiant heat” is misapplied, as the heat is really conducted heat, being conducted through the floor from the hot-water pipes to the chickens above.

Floor brooding has been in use on a small number of farms in Victoria with excellent results.

In Victoria, the method has been an adaptation of the usual brooding system by transferring the overhead pipes under the hover to the floor, and covering them with concrete. In one particular case the poultry farmer simply covered the pipes with sand and topped it off with rice hulls. The source of heat in both cases was confined to the floor space under the hover. In America, the hovers have been discarded, and the whole brooder house floor filled with 1-inch or 1½-inch pipes spaced in parallel rows 12 inches apart.

As no research work has been carried out with this system, the experience of poultry farmers has to be relied upon for information concerning its practical value.

While the system has not been generally endorsed, it has many advantages. It provides an even distribution of heat over a large area of floor space; it completely eliminates damp floors and keeps the litter dry and clean for long periods. Overcrowding rarely occurs as the chickens spread out evenly under the hover and appear to derive great comfort from the underground heat. It warms their feet and encourages them to squat while under the hover. More use is made of the heat, as the chickens come in almost direct contact with it. From a point of economy, the system has a decided advantage over the overhead-pipe system in which a considerable amount of heat is lost in maintaining the required temperature under the hover. Brooder houses are easier to clean as litter or manure do not stick to the floor.

Automatic oil burners are used to heat the boilers. Wrought-iron pipe is considered to be the most satisfactory, as it has a high resistance to rust and corrosion and a rate of expansion similar to concrete. Some steel pipe has been used, but apparently its life is not as long as that of wrought iron.

Non-ferrous metals, such as brass and copper are, at the present time, not considered as satisfactory as wrought iron, but tests need to be made to prove the efficacy of these metals for the purpose.

[M. D. HALL, Poultry Expert.]

DDT AND FLIES

DDT is sudden death to flies, and, by the correct use of this chemical, dairymen, pigowners, and horseowners should experience little difficulty in keeping their premises free of this pest. The DDT is sprayed over the places which are to be kept free of flies, and manure heaps are covered to prevent flies from laying their eggs there. Spraying is repeated every couple of months.

Half a pound of an aqueous suspension of DDT warmed until melted to liquid form and then stirred into 1 gallon of water produces a 2½-per cent. solution. This quantity is sufficient to spray through an atomiser over 125 square yards of ordinary surfaces. All the surfaces of beams, rafters, and places where flies are likely to settle should be wetted with the solution every two months.

A 2½-per cent. solution is recommended in preference to weaker solutions because it is desirable to destroy in the one operation insects other than flies, such as cockroaches, mosquitoes, silver fish, ants, bugs, weevils, and red mites, which are more resistant to DDT than flies. The stronger solution is desirable also because many of the surfaces to be wetted are full of crevices, or covered with dust and filth which reduce the effectiveness of the DDT.

Oil emulsions of DDT may affect plants and animals, but there appears to be no danger with aqueous solutions. Already many dairies, cowsheds, and piggeries have been freed of flies. Most flies are dead within a few hours of spraying and then only newly-hatched ones and those which come in from untreated premises will be noticed, but they soon die on coming in contact with the poison.

OATS FOR PIGS

With the prevailing shortage of wheat and barley there are many Victorian pig farmers who are finding that they have more stock than they can feed. The quantity of barley likely to be available for stock feeding is negligible while wheat continues in short supply and inadequate for the needs of all stock raisers. However, there are ample supplies of oats available, and the Australian Barley Board, 175 Collins-street, Melbourne, C.I., can readily supply these at 4s. 3d. a bushel in truck lots, Melbourne basis.

As a pig feed, oats cannot totally replace other grains in pig rations economically, but can be used to replace up to one-third of the grain requirements of growing baconers. Fed in this way they will enable the pig raiser to make more wheat available for his younger stock which cannot utilize oats as well. Oats are higher in fibre content than other grains, and for this reason must be crushed for feeding to pigs.

At the present relative prices of oats and wheat, wheat is still slightly cheaper when its starch equivalent is considered. However, as wheat, in sufficient quantities, is unobtainable, it is advised that part of the grain ration of pigs be composed of crushed oats.

[A. D. NORTH, B.AGR.SC., Science Field Officer.]

GOAT RAISING

All breeds of goats can be registered with the Goat Society of Australia, but, so far, the Saanen, Toggenburg, and Angora breeds are the only pure ones existing in Australia.

The Saanen and Toggenburg breeds are bred for milk production. Individuals of both breeds have frequently produced more than 440 gallons of milk in one year, a figure equal to the production of the average dairy cow in Victoria. Both breeds are of Swiss origin.

The Saanen breed was named after a village in the Swiss Alps on the scenic railway between Lausanne and Berne. The soil at Saanen is rather poor, and the goats are grazed with sheep in the Alps in the summer. They graze in most precipitous places and lead the sheep up what appear to be impassable tracks. Saanen goats are white or cream coloured.

The Toggenburg breed derives its name from its native habitat in the fertile Toggenburg valley on the plateau near Lake Constance in Switzerland. Toggenburg goats are pied with regular markings which make them very attractive.

Angora goats are kept for the production of Mohair and meat. The breed was developed in Asia Minor and derives its name from the city of Angora, now perhaps more commonly known as Ankara, the capital of Turkey. Mohair is a lustrous fibre which does not "felt" and which is of world-wide importance. Its production is of considerable value to Turkey, the United States of America, and South Africa. Unfortunately, the bulk of the mohair requirements of Australia have to be imported.

It is hoped that goat breeders will make large entries of goats in this year's Melbourne Royal Agricultural Show, in which an increased number of classes is being provided. The Secretary of the Victorian Branch of the Goat Society of Australia is Mr. Louis Monod, 422 Collins-street, Melbourne.

[A.C.T.H.]

BEEKEEPING

With the exception of a few areas where nectar is gathered during winter, the honey season terminates at the end of April. A thorough inspection of all colonies

should be made while weather conditions permit the movement of combs in the brood chamber with the convenience necessary for close examination. Should disease be found the matter should be reported to the Superintendent of Live Stock, Department of Agriculture, without delay. This would enable an investigation into the possible source of infection to be made with a view to eliminating a recurrence.

Colonies with insufficient stores to carry them through the winter should be assisted by transferring combs of sealed honey from colonies having more than is necessary for winter food.

Bees working on a Grey Box honey flow, should not be allowed to collect the water-saturated nectar of late-blooming trees. All unsealed honey not covered by the bees should be extracted and the apiary moved to winter quarters.

In the past, frequent heavy losses have occurred during the following spring among bees situated within flying distance of winter flowering Grey Box and White Box, also known as Blue Box (*E. albens*). The latter tree, while somewhat similar to Grey Box, may be recognized by a much larger flower and nectary and a bluish tinge in the foliage when seen at a short distance. The buds on the Grey Box give the impression that the blooming will be at least a fortnight later than usual this year.

[J. W. THOMLINSON, Apiary Inspector.]

CERTIFIED PULLORUM-TESTED FLOCKS (POULTRY)

A certified Pullorum Tested Flock is one in which all stock over six months of age have given a negative reaction to the agglutination test for Pullorum Disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector.

The undermentioned flocks have been certified by the Department of Agriculture, and will remain so for the current calendar year, or until such time as the Chief Veterinary Inspector determines.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Particulars of breeds of birds tested are as shown hereunder:—

A. Australorp; B. White Leghorn; C. Rhode Island Red; D. Sussex; E. Langshan; F. Brown Leghorn; G. Buff Orpington; H. Black Leghorn.

Owner.	Breed.	Number of Birds.	Owner.	Breed.	Number of Birds.
Anguey, H., Hargraves-street, Castlemaine.	A, B	775	Hanson, S. H., Box 7, Kilmore ..	A	206
Bray, J., 18 Hotham-street, Warrnambool	B	96	Inglis, W., Cobham-road, Mitcham ..	A, B	459
Coakes, G., Central-avenue, Bayswater ..	B	352	Jenkins, A. E., Pen-y-bryn, Kallista ..	..	1,076
Colquhoun, W. L., "Aringa," Ringwood	A, B	146	Molsons White Leghorn Stud, 188 Surrey-road, Blackburn	B	1,089
Corbett Bros., Torbay-street, Macleod ..	A	2,458	Salmond, J. B., Deer Park ..	H	230
Emmott, J. T., Verdon-street, Inglewood ..	A, B, C	314	Simpson, G. D., May-road, Glen Waverley	B	7,106
Frye, I. H., Grimshaw-road, Watsonia ..	A, B	1,996	Taylor, H., 132 Rathgower-road, Reservoir	A, B, C	3,171
Giarrusso, G., Braeside ..	B	801			

IN THE ORCHARD

By G. W. GAYFORD, B.Agr.Sc., Senior Horticultural Instructor

ROOTSTOCKS FOR DECIDUOUS FRUIT TREES

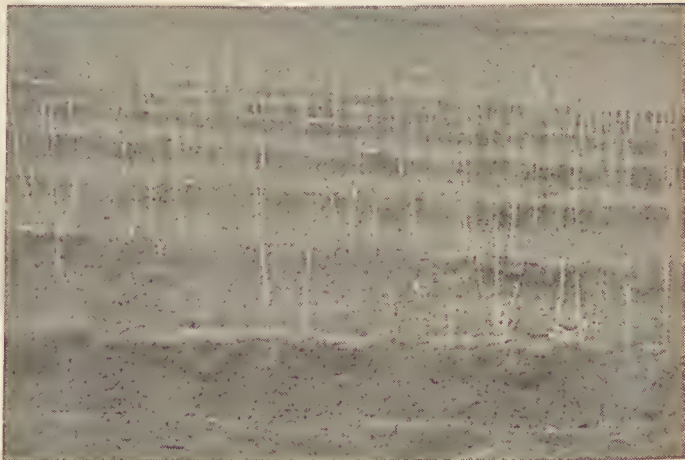
IN planting out new fruit trees the selection of the best rootstocks is of major importance for the fruitgrower. As the rootstock will have a big effect on the health and productivity of the future tree, it is essential that the grower should know something of the various stock-scion combinations so that he may be fully acquainted with the best type of trees to order from the nurseryman.

The use of separate rootstocks in the propagation of fruit trees goes far back into history. It has been known for centuries that there is an advantage in budding or grafting scions of known characteristics on to seedlings or cuttings. It is quite likely that the methods and some of the rootstocks used at the present time are of great antiquity. However, during recent years, progress has been made in overcoming some of the disabilities shown by the commonly-used stocks by the use of new types of stocks. There remains much work to be done on fruit-tree rootstocks, and, because of the length of time involved in obtaining information of this nature, it must be carried out on research stations established for the purpose. A start has been made at the Horticultural Research Station, Tatura, with rootstock trials for pears; similar trials for apples will be established on the new research station at Scoresby.

In the following notes a brief *resume* will be given of the present rootstock situation covering the principal kinds of deciduous trees.

Apple

Northern Spy, vegetatively propagated in stool beds, is the commonest rootstock for apple trees used in Victoria. The main advantage of this stock is that it is



Northern Spy rootstock stool bed.

resistant to woolly aphis. Under conditions of good soil fertility and drainage, satisfactory trees are produced on Northern Spy. However, on poorer soils such trees are dwarfed. This stock produces trees which bear fairly early, but with some varieties there appears to be a certain amount of incompatibility. The Granny Smith, for instance, suffers from die back and sometimes develops lop-sidedness on this stock.

Seedlings for apple stocks show more variation than the clonal Northern Spy stocks, but, on the whole, the trees are more vigorous and longer lived. The seed is usually obtained from the cider mills or drying plant. Seedlings are raised without much trouble. Apples on seedling stocks are common in Tasmania and are now in demand in Victoria.

The East Malling line of rootstocks provides a variation of vigour in their effect on the resultant trees, ranging from very dwarfing to very vigorous. The very dwarfing stocks are used for cordons, or espaliers, while the more vigorous types are suitable for commercial planting on good soils.

Recent work with crosses between East Malling and Northern Spy stocks has resulted in stocks which are woolly aphid resistant but some of which are more vigorous than Northern Spy. They are still in the experimental stage but show promise.

Pear

In pre-war years nurserymen imported seedlings from France—probably from seed from the perry presses. These produced trees which exhibited a wide range of vigour because of the inherent differences in the seedlings. So far, no pear rootstocks easily propagated vegetatively have been discovered. Root cuttings from vigorous trees growing on Keiffer seedlings have sometimes been used for root grafts, but naturally the supply of these would be limited.

Since French pear seedlings have become unobtainable, Keiffer seedlings have been the most popular stocks for pears and have produced vigorous trees reasonably resistant to the pear root aphid. The pear complaint known as "black end" of the fruit seems to be confined to pears or stocks which have a strain of one of the oriental pears in their parentage. For this reason, pears on Keiffer seedlings usually show a percentage in which black end trouble develops at some stage of their

life. Trees on French seedlings do not show black end. Because the more vigorous, aphid-resistant Keiffer seedlings are less variable, they are still the most suitable stocks available.

Quince rootstocks for pears have occasionally been used where soil conditions are very heavy, but these stocks have a dwarfing effect on the trees.

Peach

Peach seedlings are universally used and produce a uniform line of trees. Peach pits are obtained from canneries, and nurserymen are concerned that the installation of new peach-pitting machines involving the destruction of the pits may have serious effects on peach propagation. Almonds have been used to a slight extent in California and France, where the union is stated to be satisfactory.

Where the soil has a tendency towards alkalinity, *Prunus Davidiana*, a wild Chinese peach, is said to give good results.

Plum

The Myrobalan plum, *Prunus cerasifera*, is commonly used as a rootstock for both Japanese and European plums and produces a good union. This plum strikes readily from cuttings, and therefore produces a uniform line of clonal stocks.

The Marianna is also used, but less commonly. It is said to be less tolerant of poor soil drainage and less drought resistant than the Myrobalan. The European varieties, Angelina and King Billy, and certain Japanese varieties are sometimes propagated on peach seedling stocks for growing in light soils.

Almond

The almond grows satisfactorily on either peach or almond seedling stocks. Both stocks are used in Victoria, but the almond seedling is more generally favoured.



Eagle's Seedling cherry growing on Kentish cherry rootstock showing overgrowth of scion and restriction at union.



HORMONE WEEDKILLING

"Methoxone" is harmless to grasses and cereals but effective against a wide range of noxious weeds.

"Methoxone" is non-poisonous, non-inflammable and non-corrosive.

"Methoxone" is available for control of WEEDS in CROPS, PASTURES and TURFS.

Here are a few of the troublesome weeds destroyed by "Methoxone" — Bathurst and Noogoora burrs, Hoary cress, Nut grass, Bindweed, Water hyacinth, Horehound, Staggerweed, Stinkwort, various Thistles and the common flat weeds of turf.



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SECOND STAGE



The stems thicken and leaves become twisted and contorted.

THIRD STAGE



The foliage changes colour and the weed dies. Meanwhile, cereal crops also sprayed are completely unharmed.

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Melbourne "Sun" of 8/8/46, quoting the Wall Street Journal (America) said "**DDeATH**. Fly Control in Kansas and Oklahoma is adding millions of gallons of milk to the nation's supply."

Melbourne "Herald" 26/9/46 "Contact with **DDeATH** by the feet alone will suffice to kill many insects—and it is not necessary for the body to come into contact with the spray." Donald F. Thompson, D.Sc. Therefore, Dairyfarmers, you should use **DDeATH**. ALWAYS

The economical appeal of **DDeATH** Whitewash to Dairy-farmers is incomparable.

WOOD BORERS IN BUILDINGS IN VICTORIA

By H. B. WILSON, B.Sc.(Hons.),
Assistant Entomologist, Biological Branch

Insect damage is commonly found in building timber in Victoria. It may occur in both hardwood and softwood, either before or after the timber is used in building construction. The insects causing the damage are usually referred to loosely as borers. In most cases the damage to the framework of buildings is so small that it can be ignored. Treatment is usually quite unnecessary. This does not apply to furniture, which will be dealt with in a separate article.

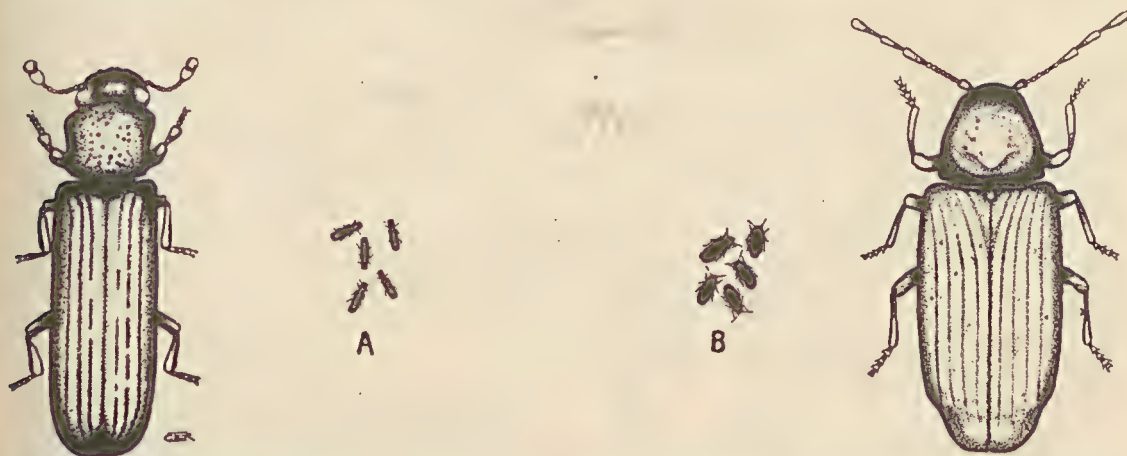


Fig. 1.—Common wood-boring insects found in buildings in Victoria. Left ; *Lyctus*, the powder post borer ; found in hardwood but never in softwoods like pine. Right ; *Anobium*, the furniture borer ; found in softwoods like Baltic pine, but never in hardwoods used in building construction in Victoria.

The grouped insects, A and B, are shown in their natural size. Groups of borers like these, however, are rarely seen under normal conditions in a building.

TYPES OF WOOD BORERS

A number of different types of insects bore into wood. In Victoria there are only two which are commonly found in buildings. These are :—

1. *Lyctus*, the powder post borer (*Lyctus brunneus*, Stephens), which is frequently found in the sapwood of hardwood and never attacks softwoods like pine.

2. *Anobium*, the furniture borer (*Anobium punctatum*, De Geer) which is found in softwoods such as Baltic pine and some local and imported hardwoods, but does not attack eucalypt timbers like those

used under the general name of "Victorian hardwood" for the framework of buildings in Victoria.

Lyctus, the Powder Post Borer

Lyctus is far more common in Victoria than *anobium*. It is frequently found in strips of sapwood on hardwood building scantling.

The sapwood of hardwood attacked by *lyctus* shows little, if any, signs of damage until several months after the attack commences. Then, usually during the summer months, holes about $\frac{1}{16}$ inch in diameter appear in the surface of infested wood,

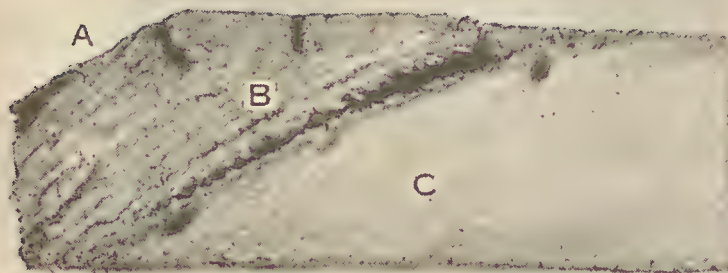


Fig. 2.—Cross-section of 3" x 1" hardwood batten (slightly enlarged) milled from the extreme outside of the log showing how lyctus damage is confined to sapwood. The missing corner of the batten was originally occupied by bark. The sapwood which was immediately underneath this bark can be seen as a slightly curved band about 1-inch deep underneath the missing corner.

A.—Outer surface of log under bark. B.—Damaged sapwood.
C.—Sound heartwood.

and from these holes a fine, cream-coloured, floury dust is pushed out. If the surface of infested timber is broken, numerous little tunnels will be seen packed with dust. Tiny white-curved grubs, and an occasional small brown beetle may be found amongst the dust in the tunnels.

TYPE OF TIMBER ATTACKED

Lyctus attacks only the sapwood of a variety of hardwoods, including the sapwood of some of the Victorian eucalypts, such as messmate stringy bark (*E. obliqua*) which is used in building construction. In these timbers the sapwood is a band of wood about 1 inch in depth beneath the bark of the growing tree. The amount of sapwood, i.e., timber liable to borer attack in a large tree of Victorian hardwood is, therefore, quite small. The possible extent of borer damage in Victorian hardwood is further reduced by the variation in the starch content of the sapwood. At least half the sapwood is free from attack because it does not contain enough starch, which is the food of the lyctus grub.

LIMITATIONS OF LYCTUS DAMAGE

Figure 3 shows diagrammatically the position and depth of the sapwood layer on a log of Victorian hardwood. When a log

is sawn some of the outermost pieces of timber are discarded, but some of the sapwood is included in building scantling which is frequently cut from the outside of the log. The sapwood occurs as narrow strips on the sides and edges of some of the boards (see Fig. 4). The percentage of pieces in Victorian hardwood building scantling containing these narrow strips of sapwood is not large. According to unpublished information supplied by the Division of Forest Products, Council for Scientific and Industrial Research, the figure is probably less than 15 per cent. About half of this small amount will be immune from lyctus attack because of the low starch

content, so, in any average parcel of Victorian hardwood building scantling, or in any building framework constructed of Victorian hardwood, probably more than

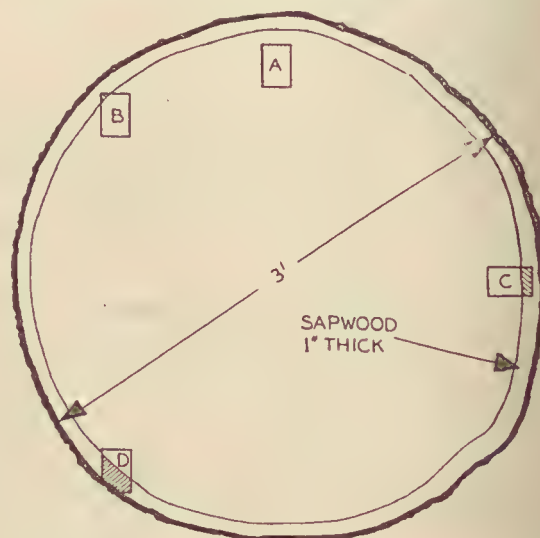


Fig. 3.—Cross-section of hardwood mill log showing thin layer of sapwood (approximately 12 per cent. of volume of log) and positions (rectangles A, B, C, D) from which building scantling may be cut. A.—Represents 85 per cent. of scantling free from sapwood and immune from borers. B, C, D.—Represent 15 per cent. scantling containing varying amounts of sapwood, approximately half of which may be liable to borer attack.

90 per cent. of the timber will be immune from lyctus attack (see Fig. 5). Furthermore, the amount of sapwood present on any piece of the remaining timber will, in most cases, be small in proportion to the total amount of timber in the piece.

With its boring confined to such a small proportion of the timber, it is plain that

lyctus could not cause damage of any practical importance to a hardwood building framework. It is extremely doubtful, as a matter of fact, whether it has ever been necessary to replace any part of a Victorian hardwood building framework because of structural damage due to lyctus attack.

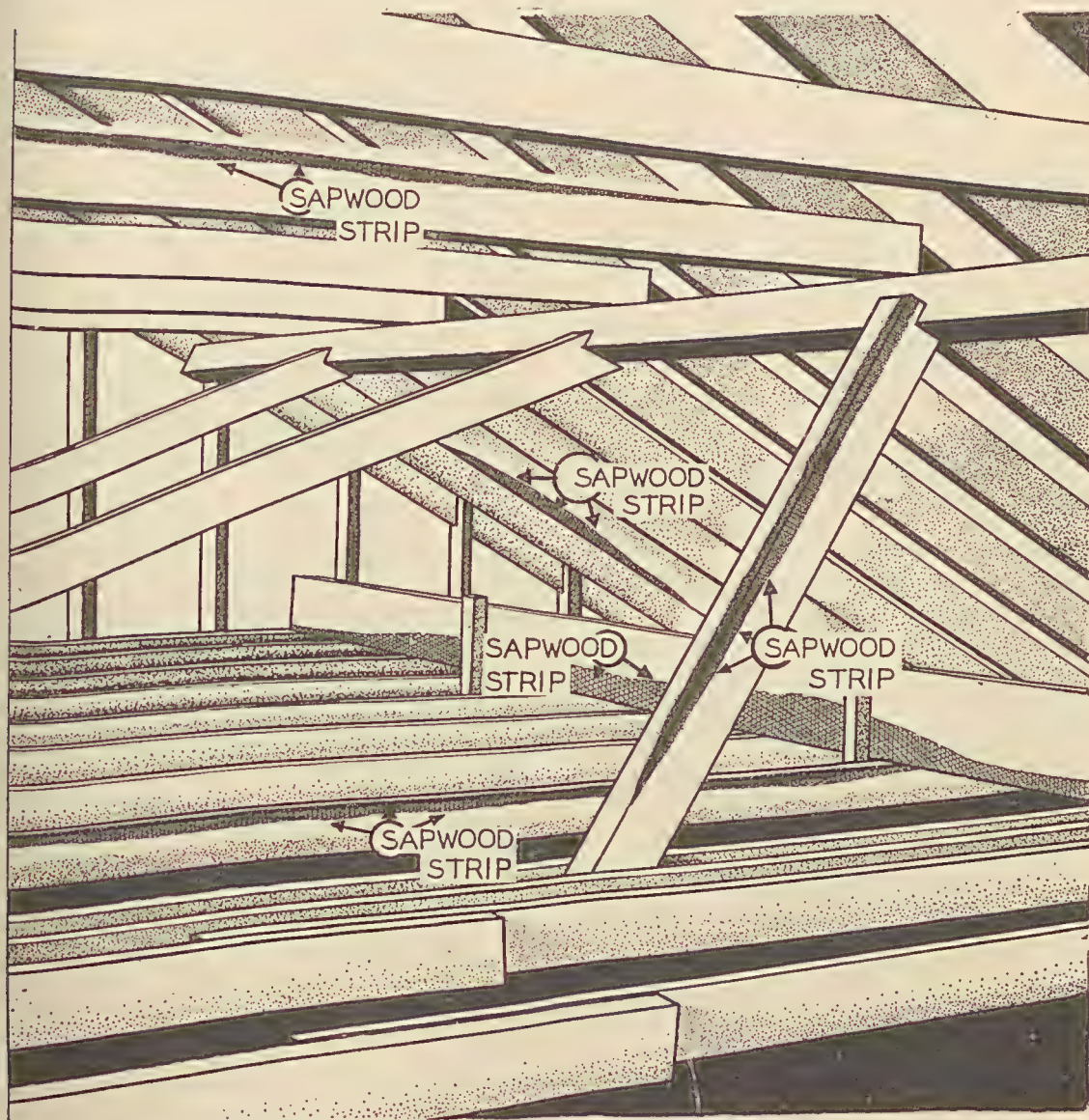


Fig. 4.—Section of roof framework (certain members omitted for clarity) showing typical distribution of pieces of scantling on which sapwood is present in an average Victorian hardwood building framework. Borer attack in this typical roof section would obviously be of no structural importance, as the damage would be confined to the five narrow sapwood strips illustrated. Most frameworks would contain less sapwood than shown here, and, in consequence, would suffer even less damage.

LIFE HISTORY OF LYCTUS

The adult lyctus insect is a slender brown beetle about $\frac{3}{16}$ inch in length. The female lyctus beetle deposits her eggs in the "pores" of hardwood timbers, usually during the summer months. These "pores" are minute tubes running through hardwoods in the direction of the grain. They are not present in softwoods like pine. The eggs hatch after a few days, producing minute white grubs, too small to be seen with the naked eye, which bore into the wood. Under favourable conditions they continue to bore and grow for several months, converting the wood they bore through to a fine, floury dust. With the approach of the next summer the grubs rest and pass through a pupal stage during which they are transformed to beetles. These cut holes in the surface of the wood and emerge. If the wood is covered by leather, paper, lead sheet, plaster, or other substances of moderate hardness, the beetles may bore through these to escape. Mating then takes place and the females proceed to lay eggs.

It should be noted that the holes are made by the emerging beetles after the grubs have bored for several months. No mark is made on hardwood timber when lyctus eggs are deposited in the pores.

OCCURRENCE OF LYCTUS

Lyctus is widespread throughout Australia. The insects are good fliers and are also carried about in consignments of timber. They are rarely observed and tend to seek cover from the light during the day. Owing to their wide distribution in Victoria, hardwood sapwood is liable to be exposed to attack shortly after the timber is sawn from the log, and at any time afterwards at any place within the State.

TIMBER SEASONING AND LYCTUS ATTACK

Both air and kiln-seasoned timber are just as liable to lyctus attack as any other kind. Kiln drying will kill lyctus eggs, grubs, or beetles in the timber, but will not make the timber unsuitable for re-infestation.

DETECTION OF LYCTUS IN NEW TIMBER

Owing to the fact that lyctus makes no mark on timber when it deposits eggs, it is impossible to say whether timber is infested or not, unless flight holes can be seen, or unless the dust-filled tunnels are exposed by cutting. There is no simple

practical method for determining whether timber which appears to be sound, contains lyctus or not. If timber remains free from lyctus for two summers or more after milling, it is almost certain to be immune from attack.

LYCTUS ATTACK IN NEW BUILDINGS

The following stages will usually be observed in a typical case of lyctus attack in a new building:—

1. Attention will be drawn to the accessible parts of the framework such as the rafters, by the appearance of cream-coloured dust which can be traced back to some of the framing timbers.

2. Examination of the framework will show that certain pieces of timber contain holes about $\frac{1}{16}$ inch in diameter, and that fine cream-coloured wood dust is being pushed out of these holes.

3. Closer examination will show that the holes are confined to a strip along the sides or edges of the affected pieces. These infested strips may have bark attached to them, or a smooth surface where bark has been, indicating that the damage is confined to sapwood.

4. Inspection of the damage over a period of years will show that it does not spread, but remains confined to the same strips of sapwood on the same pieces of timber. During the next summer after the discovery of the damage, a little more dust and a few more holes may appear. After that the damaged strips will remain unchanged, although dust may fall from them if they are shaken. A careful estimation of the actual amount of damage will usually show that it is of no practical importance. The explanation of this typical sequence is as follows:—

The few sapwood strips on the scantling in a typical building framework are infested before the building is erected. Eggs can be laid in timber by lyctus at any time or place after the timber is milled, and, owing to their widespread occurrence and powers of flight, lyctus insects soon find all the strips of sapwood on freshly-produced timber. During the erection of a building framework the few pieces of timber containing infested sapwood are distributed at random throughout the structure. The grubs continue to bore in these sapwood strips, and, during the first or second summer after the completion of the building, they change to

beetles which cut their way out, leaving the small flight holes. The movement of the grubs remaining in the timber causes the fine dust produced by their boring to be pushed out of the flight holes.

The sapwood strips are almost completely eaten out by the end of the first summer. The fragments of sound sapwood remaining between the insect tunnels are destroyed by the second brood of grubs during the following year, and the insects then disappear leaving behind a few scattered pieces of scantling with damaged sides and edges. These will remain unchanged throughout the life of the building.

APPARENT SPREAD OF LYCTUS IN BUILDINGS

The distribution throughout the framework of a new building and such adjoining structures as garages, outhouses, &c., of a few pieces of timber containing sapwood can be responsible for the erroneous impression that lyctus attack in a building is spreading rapidly. Holes and dust usually appear in all the sapwood strips in a new building at about the same time, simply because all the sapwood was infested at about the same time.

TREATMENTS TO PREVENT OR CONTROL LYCTUS

As lyctus causes such slight damage to building frameworks in Victoria, protective treatments are quite unnecessary. House frameworks are sometimes sprayed to prevent lyctus attack, a practice which is not only unnecessary, but, in most cases, entirely futile, for the sapwood strips are usually infested long before the treatment is applied. Sprayed liquids will *not* penetrate Victorian hardwood and reach the lyctus grubs working beneath the surface, no matter how great the pressure with which they are applied. The sprayed material will merely lie on the surface like a coat of paint. To be effective, protective

treatments must be carried out at the mill as the timber leaves the saw.

Treatment of building scantling to eradicate or control borer attack in sapwood strips in which flight holes and dust have been observed is also of no practical value. By the time the flight holes appear, most of the damage, which is usually of no importance in any case, has already been done. Treatment at this stage is, therefore, comparable to shutting the stable door after the horse is stolen.

LYCTUS IN FLOORING AND LINING TIMBERS

Lyctus is occasionally found attacking flooring or lining timbers such as mouldings, skirtings, panellings, &c., but the damage is not important because the amount of sapwood in these classes of timbers is usually very small indeed.

RISK OF DAMAGE TO FURNITURE BY LYCTUS

The presence of lyctus in the framework of a building does not appreciably increase the risk of lyctus damage to timber articles housed in the building. These will be continually exposed to attack by insects

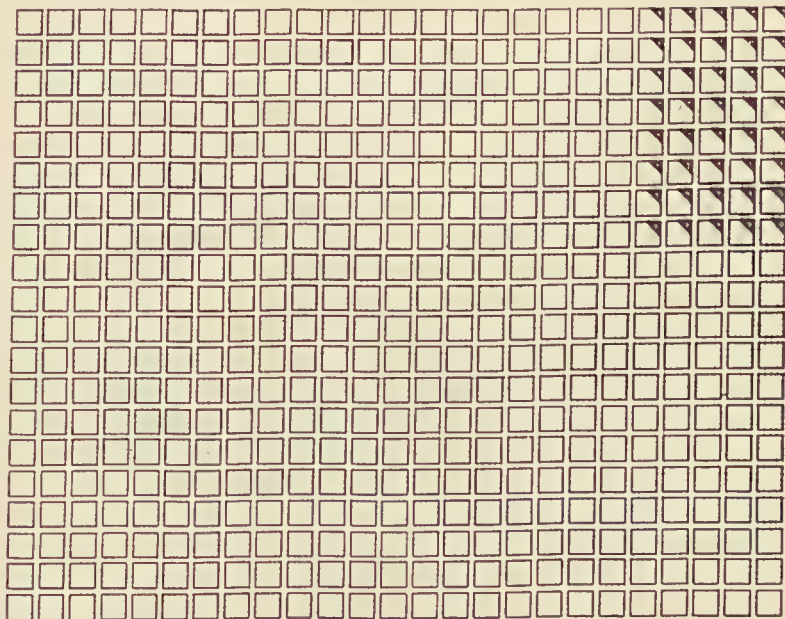


Fig. 5.—Each square in this diagram represents a piece of timber in an average Victorian hardwood building framework. The white squares represent timber which is immune to borer attack. The squares with black corners represent pieces of timber on which sapwood strips liable to borer damage are present. These pieces amount to approximately 8 per cent. of the total, an insignificant proportion. On some pieces the sapwood strips will be small. It is obvious therefore, that the possible amount of borer damage in a Victorian hardwood building framework is negligible.

flying into the building from the surrounding district. If the timber articles contain hardwood sapwood liable to attack by lyctus, it will be found by the insects sooner or later, and usually within a short time after the manufacture of the articles, even if the framework of the building is never infested.

Anobium, the Furniture Borer

Anobium is rarely seen in modern buildings in Victoria, because it confines its attacks to softwoods like Baltic pine and some imported and local hardwoods. Fortunately, it does not attack the hardwood timbers used in Victoria for building construction.

APPEARANCE OF THE DAMAGE

Anobium damage is similar to lyctus damage. Infested timber shows no signs of attack for a period of at least several months after the infestation commences. Then holes appear and wood dust is pushed out from them. The holes are similar in size to lyctus holes, but the dust has a gritty feel, while that of lyctus is soft, when rubbed between the fingers.

TYPE OF TIMBER ATTACKED

Anobium attacks a variety of softwoods and hardwoods, and, unlike lyctus, does not confine its attack to sapwood. There is a belief that anobium prefers old timber, a belief which finds some support in the fact that anobium is frequently found in old timber. It is possible, however, that anobium spreads slowly, much more slowly than lyctus and new timber may remain for years free from infestation simply because it has not been discovered by the insect. It would certainly be unsafe to assume that timber of a kind which anobium has been known to attack will be resistant because it is new. Anobium is also a slow worker by comparison with lyctus, and timber such as Baltic pine flooring may be infested for years and still retain sufficient strength to be of use. Once timber is infested, however, the attack will continue steadily, and the damage will spread slowly throughout the entire amount of wood available.

LIFE HISTORY OF ANOBIUM

The adult anobium insect is a small, dark-brown beetle about $\frac{3}{16}$ inch in length. The head is hidden when seen from above by the thorax which covers the head like

a cowl. The female insect lays eggs in cracks in the timber, and the minute grubs which hatch out bore into the timber and produce a maze of tunnels packed with a fine, gritty wood dust. After a period of at least several months the white-curved grubs pupate and are transformed to beetles which cut flight holes in the surface of the timber and emerge. Like lyctus, anobium makes no obvious mark on timber when eggs are laid, and the first sign of infestation is the appearance of the flight holes. During emergence, anobium will bore through such substances as lead sheet, in order to escape. The newly-emerged insects mate and egg-laying proceeds again.

Anobium appears to be widespread throughout Australia, distributed no doubt, by the movement of infested timber articles such as furniture.

CONTROL

As anobium can cause extensive damage to softwood flooring and lining timbers in buildings, action should be taken to control infestations when they are discovered. If the timber is badly damaged, the best course is to replace it. When the infestation is slight, or when replacement is not desirable, the flight holes can be treated by injecting them with a solution of one part of paradichlorobenzene in ten parts of kerosene. The liquid will penetrate the dust-filled tunnels and kill the grubs. A small syringe is useful to force the liquid into the tunnels.

Anobium damage in building timber may be distinguished from that of lyctus by the fact that lyctus is not found in softwoods such as pine, and by the difference in the feel of the wood dust. If there is any doubt as to the type of insect, a specimen of the damaged timber should be forwarded to the Biologist, Department of Agriculture, Burnley Gardens, Burnley.

Other Types of Borer Damage Observed in Timber

PINHOLES

Building timber may often contain small holes about $\frac{1}{16}$ inch in diameter, free from dust and surrounded by dark-stained wood. These are pinholes made by forest insects in the living tree or the freshly-fallen log. As the sawn timber dries, the insects die out leaving the dark-stained

holes. Pinholes are short holes cut across the grain of the wood. A pin can usually be inserted into them up to the head. This, together with the absence of dust, distinguishes them from the holes of lyctus and anobium into which a pin can usually be inserted for a short distance only. Pinholes are of no more importance in the timber than a corresponding number of small nail holes.

TERMITE (WHITE ANT) DAMAGE

Building scantling sometimes shows termite damage, irregular cavities exposed by the sawing of the timber. If the timber is fresh from the mill, living termites may be seen. These will appear as creamy, slow-moving, six-legged insects about $\frac{3}{8}$ inch in length, sometimes associated with dark-brown winged individuals. These termites are forest insects and cannot live in seasoned timber in a house. As the green timber dries they will die out. No treatment is necessary. As soil-dwelling termites, however, can cause serious damage to seasoned timber necessitating special treatment, further advice on this matter should be obtained from this Department.

BOSTRYCHID BORERS

Victorian hardwood sapwood is sometimes attacked while green by a small forest insect called *Xylion collaris*, belonging to a family of beetles called the *Bostrychidae*. Cases of attack are rare and the damage is similar to that of lyctus. The insects cannot cause serious damage to seasoned timber although, on occasions, the adult beetles have been known to make short holes like pinholes in seasoned timber over short periods during the summer months. The insect is about $\frac{1}{4}$ inch in length and can be recognized by its reddish head and blackish body the tip of which is bevelled sharply like the end of a chisel. The damage caused is usually insignificant. No treatment is necessary.

Lyctus-Resistant Timber

Certain Victorian hardwoods are much less liable to lyctus attack than others, because of the low starch content of the sapwood. If supplies of such timber are required, further information may be obtained from the Forests Commission of Victoria, or the Forest Products Division, Council for Scientific and Industrial Research.

ORCHARD NOTES (continued from page 182)

Apricot

Apricots have been grown on apricot and peach seedlings and plum (*Myrobalan*) stocks. Plum stocks are only recommended for heavy soils and peach stocks for light, well-drained soils. For most purposes, in the Goulburn Valley for instance, the apricot seedling is favoured.

Cherry

Cherry trees may be grown on Kentish or sour stocks, *Prunus cerasus*, Mazzard (*Prunus Avium*) or *Prunus Mahaleb*. The variety producing strongest, longest-lived trees in Victoria is the Mazzard. The

Mahaleb does not produce such long-lived trees. With the Kentish cherry overgrowth of the scion sometimes occurs, and, after a number of years, the conducting tissue between the stock and scion breaks down, resulting in the death of the tree.

Walnut

The most satisfactory rootstock for the walnut, according to local and overseas experience, is the Northern Californian Black walnut, *Juglans Hindsii*. This stock produces vigorous trees and is resistant to *Armillaria* root fungus, but it is said to be susceptible to crown rot.

THE VEGETABLE GARDEN

By GEORGE HYAM, Horticultural Supervisor

APRIL PLANTINGS

S EEDLINGS of early white onions should be planted out this month, and sowings of the Odourless and Early Globe varieties can be made in the seed-bed.

Onion seedlings should be planted so that their roots are just covered with soil; too deep planting, especially in the heavier soils can affect the size of the bulb when this is swelling later in the season. Onions do not need manuring at the time of planting if they follow any other crop that has been well manured. In other soils, use about 2 oz. of blood and bone to the square yard. Forcing manures are best applied as side-dressings just as bulbing commences.

The last planting of cauliflower seedlings should be made this month; late Metropole is the best variety for April planting.

East Ham and Savoy are the best cabbage varieties to plant now.

Vegetable seeds which can be sown this month in all districts are broad beans, turnips, swedes direct in the beds, and lettuce (Imperial D or Webb's Wonderful), and green broccoli in seed beds for transplanting later. Endive, or Curly Lettuce, can be sown for transplanting in all districts and is to be preferred to hearting lettuce for winter use in heavy rainfall districts as it is less subject to mildew.

In northern districts, April is a good month to sow Osborne Park or Shorthorn carrots; Detroit or Early Wonder red beet, and Hollow Crown parsnips. Silver beet can be sown or planted out. William Massey (Melbourne market) peas can be sown in irrigation districts for early crops.



A plant of Endive (Curly Lettuce).

GREEN MANURING IN THE GARDEN

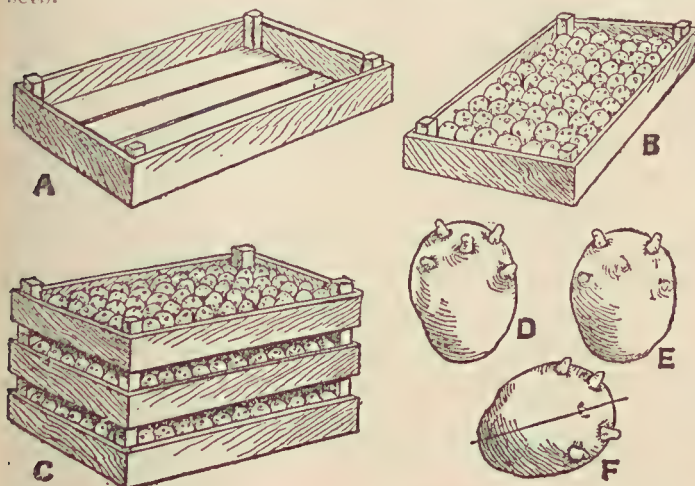
As winter vegetables do not occupy so much space as the summer crops, larger gardens often have beds vacant after the summer crops have been harvested. Rather than leave these uncultivated, opportunity should be taken to increase their humus content by sowing some green cover crop to turn under in the spring, preparatory to the summer plantings. Suitable cover crops include barley, tick beans, field peas, or sweet clover which can be sown separately or in conjunction and these will be ready for turning in during September.

If the beds are required earlier, mustard will be found to be a good soiling crop. This can be turned in in early August. Seeds can be sown broadcast or in drills.

Before sowing, it is advisable to apply about 1 oz. of superphosphate to the square yard. In highly fertile soil, the normal weed growth alone will provide considerable humus material if left to grow on until the spring, but sown crops will give the greater bulk.

SEED POTATOES

Although the planting season does not start until July, and then only in early districts, it is advisable to secure potato sets at this time of the year or to select seed potatoes from last season's crop so that they can be properly greened. This consists in exposing the tubers to light, away from frost, preferably in shallow trays. The main shoots will develop into sturdy shoots and the skins will harden and turn a dark green colour. The shoots will not lengthen if kept well in the light. Seed potatoes kept in bags or in the dark develop many long, weak shoots and these reduce the vigour of the set. When purchasing seed potatoes it is advisable to specify "Government Certified" seed which comes from areas known to be free of disease. When saving seed from home-grown crops, choose the tubers from plants that are free from any abnormality and that have borne a good percentage of fair-sized potatoes. Plants bearing only a few large-sized or many small tubers do not produce good sets.



Potato sets should be "greened" before planting. A, B, C—Greening trays. D, E.—Sets over 2 inches in diameter should be cut as shown, F.

SAVING VEGETABLE SEED

While in general the economy or advisability of saving vegetable seed in the home garden is doubtful, it is worth while saving the seed of French or climbing beans as well as those of butter beans if the crop has not been affected with any fungous disease. Preferably, it is best to select specially good plants and allow these to grow on to seed without picking. Allow the beans to remain until the leaves yellow and start to fall. Then pull up the plants, tie them loosely into bundles, and stack under cover. When the pods and stems become brittle-dry, the seeds can be readily threshed out.

Parsnip seed, on account of its short life and the consequent necessity for fresh seed for sowing, is worth saving. As for all roots, parsnip seed is grown by replanting roots selected from the previous crop when lifting, and replanting these from April to June. Such seed-roots should be well-formed, typical in shape, and free from all abnormality. The produce of one root is generally sufficient for a private garden.

Onion seed is produced in a similar way, i.e., by replanting a selected bulb during the same months. The seed crops of these plants are ready in the following January. Care should be taken not to allow any or the roots or bulbs of the same species to casually set seed, otherwise an undesirable strain may be introduced.

Harvesting of the seed of root crops takes place when the first seed-heads ripen. The whole plant is then pulled up or the seed-heads cut off with long stems. These are "cured" until all the stems become brittle before threshing—as for beans.

In saving tomato seed select full, ripe fruit from disease-free plants, and extract the seed by covering the pulp with water in a glass jar. In a day or two, fermentation occurs which causes the seed to fall to the bottom and the pulp to rise. The water and pulp are gently poured off; the seed is strained immediately and spread out to dry.

Accredited Brucellosis-free Herds (Swine)

The following herds of pigs have been credited as free of swine brucellosis (contagious abortion of pigs) by the Department of Agriculture.

An accredited brucellosis-free herd of pigs is one in which all animals therein have been subjected to two successive blood tests for brucellosis with negative results at intervals proscribed by the Chief Veterinary Inspector of the Department.

In order to remain accredited, a semi-final or annual re-test (as determined by the Chief Veterinary Inspector) of all animals in the herd shall be conducted. If, at a re-test, any animal fails to give a negative reaction to the test, the herd shall not be declared brucellosis-free again until two tests of the complete herd have been carried out with negative results.

Full particulars of the Accredited Swine Brucellosis-free Herd Scheme and application forms may be obtained from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Name.	Address.	Name.	Address.
Anderson, W. H. and C. H.	"Merrileugh," Inverloch	Harrison, C. T.	"Eastside," Pomborneit
Baker, J. J. ..	Bannockburn	Hawtin, I. E. and F. ..	"Rossmoyno," Colac
Barclay, F. ..	Tyabb	Haywood, Dr. A. R. ..	Hastings
Barclay, T. H. ..	Tyabb	Haywood, G. T. B. ..	Cranbourne
Barker, E. F. ..	Killingsworth	Hodgins, A. S. ..	Tyabb
Bell, John T. ..	Yarra Glen	Howard, Alex. ..	Glenfyne
Betts, V. R. ..	Craig's Lane, Pomborneit	Jackson, Wm. C. ..	"Patterdale" Stud, Main Ridge
Bidgood Bros. ..	Wodonga	James, W. E. ..	Templestowo
Bodey, A. A. ..	"Bonnyview," Dooen	Jephson, W. T. ..	Stacey's Bridge
Bright, George H. ..	Dumbalk	Kergerm, A. C. ..	Marshall
Buller, R. A. ..	Beaconsfield	Kilby, E. A. ..	Narre Warren North
Butler, J. H. ..	"Meadow Banks," Newstead	Lacey, S. T. ..	Main Ridge
Cardwell, S. R. ..	Eskdale	Longerenong College	Dooen
Cash, I. M., and Sons	Jindivick	Mackenzie, A. S. ..	Upper Beaconsfield
Castle, L. H. ..	Clarinda	Marriott, F. C. ..	Bentleigh East
Chapple, S. T. ..	Rye	Marshman, A. D. ..	Archie's Creek
Chard, F. J. ..	Private Bag, Terang	Miller, A. J. ..	"Glenvale," Whittlesea
Chisholm, R. J. ..	Archie's Creek	Mills, Robert ..	Naring East
Churchill, S. R. ..	Narre Warren, North	Mundy Bros. ..	Orbost
Churchill, Stanley	Woolamai	McInerney, M. J. ..	Nyarrin
Coates, R. J. H.	Corangamite	Myers, F. P. ..	Bittern
Cockbill, Wm. ..	Rockbank	McMillan, Walter N. ..	Mooroopna North
Cornell, J. ..	Wheeler's Hill	Noble, T. M., and Sons ..	Maffra
Coster, John ..	Newry	Northcote Children's Farm	Bacchus Marsh
Cox, H. H. ..	Jacaranda Stud, Leopold	Osborne, L. R. ..	Strathfieldsaye, via Bendigo
Critten, H. S. ..	Dumbalk	Peters, W. H. ..	Heatherton
Devine, Herbert	Swan Marsh	Petersen, E. V. ..	Korumburra
Dingwall, A. E. ..	Maffra	Richards, Albert H. ..	Dumbalk, via Meenyan
Dookie Agricultural College	Dookie	Rintoul, J. T. C. ..	Glengarry
Doornbusch ..	"Starpark," Nhill	Roy, W. A. ..	Morrell's Hill, via Boolarra
Dougall, J. K. ..	Hastings	Russell, J. A. and A. D. ..	Hendersyde, via Tatura
Dowie, Alexander	Mt. Moriac	Sexton, John ..	Swan Marsh
Doyle, Dr. G. ..	Arthur's Creek	Simpson, Ronald D. ..	Birregurra
Dunstan, John ..	Tomahawk Creek	State Experiment Farm	Rutherglen
Ellwood, A. H. ..	Paschendale	Sykes, W. F. V. ..	Elmore
English, G. H. ..	Tongala	Taylor, B. Hogan ..	Wandean Farm, Harkaway
Fairchild and Clutterbuck	Tinamba	Trenery and Soderland ..	"Promview," Foster
Fraser, A. D. J. ..	Bamawm	Trigg, A. J. ..	Bungaroo
Garry, Thos. E. ..	Kernot	Trigg, N. H. ..	Bullarook
Gay, Leonard M. ..	Gormandale	Tweddle, J. T. ..	"Winlaton," Shepparton
Goding, Bros. ..	Moorooduc	Warry, A. and Sons ..	Delburn
Greig, J. F. and I. S. ..	Gnotuck	Whelpton, B. ..	Whittlesea North
Hamblin, A. T. and Sons	Toolleen	Whytercross, D. J. (Jur.) ..	Swan Marsh
Harris, Clement C. ..	"Egerton Villa," Loch	White, G. W. ..	Boolarra South
Harris, J. D. ..	Maiden Valley	Williams, Geo. A. ..	Paternoster-road, Emerald

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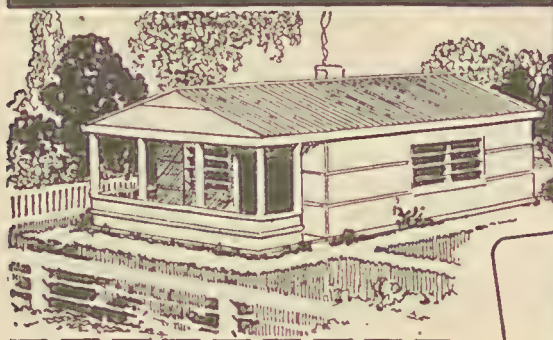
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Potato Varieties in Victoria

By G. H. Mattingley, Potato Expert



Picturesque potato-growing country in the Neerim area.

COMPARED with other countries the list of potato varieties grown on a commercial scale in Victoria is exceedingly small. In the absence of any serious attempt, until recently, to breed potato varieties particularly suited to the Australian climate, the opportunity has been taken on various occasions to draw upon varieties from other parts of the world, but none of these importations has proved entirely adaptable to local conditions. It is interesting to note, in this connexion, that American material has been of most use, as, with one or two exceptions, varieties of British origin have failed to crop satisfactorily in Australia.

The most likely reason for this is put forward by Bald (1) who contends that, whereas English varieties are grown under long-day conditions with low-light intensity,

some American potatoes are developed in an environment more nearly approximating the Australian, namely one of shorter days, brilliant sunlight, and dry summers.

The most important features which determine the usefulness of a potato variety are its adaptability to a particular environment, resistance to disease, and an ability to produce a high yield of good-quality tubers of smooth regular shape under the normal range of seasonal conditions.

It would facilitate matters such as handling and storage on the farm and ensure that the consumer received a more standardised article, if one variety were adaptable to all the districts in the State, as is the case in Western Australia.

However, as it is desirable to ensure a spread of planting and harvesting operations from the points of view of utilizing available

NOTES ON THE COMMERCIAL VARIETIES

Early Carman

The potato grown under the name Early Carman is actually Green Mountain, which was imported from U.S.A. in 1907, and has become one of the leading early varieties in Victoria. The tubers are oval to oblong with blunt ends, well-shaped, with shallow eyes, and are of excellent quality. The foliage is fairly large and spreading; the flowers are white. Early Carman is a good cropper and matures in about three and a half months. It is grown for the early crop in the market garden areas near Melbourne and Geelong, and as an early mid-season crop in Romsey, Leongatha, and Thorpdale districts.

Late Carman

Late Carman, the leading commercial variety in Victoria, is sometimes referred to as Carman No. 3, but it is distinct from the American variety of that name. It is highly probable that it is a late strain selected by local growers from Green Mountain. The foliage closely resembles that of Early Carman until flowering time, when



Early Carman.

labour to the best advantage, and to cater for seasonal contingencies to which one variety may be more susceptible than another, it becomes necessary to employ several. Moreover, the Victorian crop is planted from June in the earliest coastal districts to the end of December in the latest areas in the Central Highlands with consequent diversity of climate and environment, therefore, no one variety could be expected to serve in every instance.

During the past 40 years there has been a natural elimination of potato varieties grown in Victoria which has resulted in 75 per cent. of the acreage being devoted to two, namely, Carman and Snowflake.

In the season 1946-47, when 56,377 acres were planted in Victoria, the percentage sown to each variety was as follows:—

Variety.	Percentage.
Carman (Early and Late) ..	56.0
Snowflake	19.0
Katahdin	9.2
Up-to-date	8.0
Sebago	5.4
Others	2.4



Late Carman.

it produces axillary shoots at a comparatively rapid rate. The flowers are white; the tubers are large, oblong with blunt ends, and have a smooth white skin, and are of excellent quality. Late Carman is a good cropper but requires reasonably fertile soil and favourable conditions of growth during the period of tuber formation. A disadvantage is susceptibility to the mosaic viruses. Late Carman is classed as mid-season to late, maturing in four to four and a half months. It is grown as a main variety in all mid-season to late districts.

Snowflake

The origin of the Snowflake variety is obscure. Formerly known as the Acme, it was brought to Victoria from the Sydney Royal Agricultural Show about 1890, and has since become the main variety in the Central Victorian Highlands. The foliage is tall, erect, and vigorous with small crinkled leaflets. Flowers are pale blue, tipped with white and the tubers are long, rough, with deep eyes and a creamy skin sometimes flecked with purple at the heel. Snowflake is a heavy cropper of medium quality and is well suited to districts with irregular summer rainfall, owing to its characteristic of forming tubers late in the season. Snowflake is a late variety maturing in about five months.

Katahdin

Introduced from America about ten years ago, Katahdin has proved of value in the market-garden areas and in other soils of

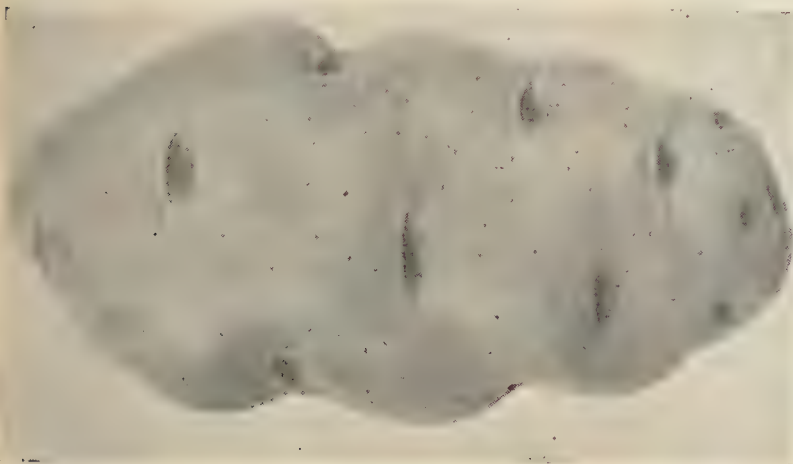


Katahdin.

lighter type where regular rainfall is experienced. It is a mid-season variety, but, owing to the fact that the tubers approach maximum size comparatively early in the life of the plant, it may be harvested as a second early crop. The tubers are glossy-white, flat-round, with shallow eyes, and are of fair cooking quality. A feature is the absence of second growth even under the most adverse conditions. Katahdin is highly resistant to mild mosaic, and under average conditions is slow to contract rugose mosaic (virus Y).

Up-to-date

One of the few standard varieties of British origin to have done well in Australia, Up-to-date is a good general purpose sort, yielding fair crops under a wider range of soil and climate than most other varieties. A mid-season variety, Up-to-date has tall, vigorous, glossy foliage with an abundance of light, red-purple flowers. The tubers are oval to kidney in shape with a smooth, creamy skin, and are of medium quality. A disadvantage is their tendency to



Snowflake.

produce a large proportion of small tubers under any but the most favourable conditions.

This variety is gradually going out of cultivation in favour of newer introductions such as Sebago.

Sebago

Another variety of American origin imported into Victoria in 1940, Sebago has a wider adaptation to various soil and climatic conditions than Katahdin, and has found favour in most potato-growing districts. It is resistant to Late Blight and highly resistant to the virus causing mild mosaic, but, on the other hand, it is most susceptible to Spotted Wilt and succumbs more readily to diseases such as Bacterial Wilt (*Bacterium Solanacearum*) and Fusarium tuber rots than other varieties. Sebago is a mid-season to late, tall-growing sort with lilac flowers, and produces good yields of white-skinned, regular-shaped, thick, oval tubers of fair table quality.

POTATO VARIETY TRIALS

On several occasions within the past ten years, parcels of varieties of overseas origin have been brought into Victoria in the hope that some types more suitable than those already existing will be found. These

include Sequoia, Chippewa, Houma, Sebago, Katahdin, all from America, and Inverness Favourite from England. In order that a correct valuation can be made of the performance of such varieties under local conditions, variety trials were established in 1946 at four centres, namely, Geelong, Koo-wee-rup, Kinglake, and Ballarat. These districts were chosen because they represented a wide range of climatic and seasonal conditions.

Geelong

The plots in the Geelong district were planted at Wallington on 7th August, 1946, in a light sandy-loam soil; the crop was fertilized with 8 cwt. per acre of superphosphate and ammonia 6:1. It was harvested on 31st December, 1946, before the majority of the varieties were mature, because of the danger of losing the crop through the depredations of the grub of the potato moth. At this date Chippewa and Houma were mature, Manistee, Early Carman, and Katahdin were slightly green, while the remainder were some weeks off maturity.

POTATO VARIETY TRIALS, GEELONG, 1946-47.

Variety.	Marketable Tubers Yield per Acre.	Undergrades Yield per Acre.
	Tons Cwt.	Tons Cwt.
Sequoia	5 6	0 5
Up-to-date	4 10	0 16
Sebago	3 14	0 9
Manistee	3 14	0 11
Katahdin	3 12	0 12
Early Carman ..	2 19	0 7
Chippewa	2 8	0 9
Houma	2 5	0 17

The above result is significant if the difference in yield between any two varieties is greater than 5 cwt. per acre in the case of marketable tubers, or 2½ cwt. in the case of the undergrade tubers.

Koo-wee-rup

The Koo-wee-rup plot was planted in the peaty soils at Cora Lynn on 22nd October, 1946, with a fertilizer dressing of 5 cwt. per acre of superphosphate and ammonia 6:1. Harvesting was done on 19th March, 1947, when all the varieties were fully mature. It should be noted when reading the table of results that an average of three-quarters of the yield listed as undergrade



Sebago.

was comprised of large tubers badly infested with grub.

POTATO VARIETY TRIALS, KOO-WEE-RUP, 1946-47.

Variety.	Marketable Tubers Yield per Acre.		Undergrades Yield per Acre.	
	Tons Cwt.		Tons Cwt.	
Sequoia	5	8	2	3
Sebago	4	17	1	7
Late Carman ..	3	17	2	4
Katahdin	3	14	1	8
Up-to-date	2	13	2	8
Early Carman ..	2	8	1	2
Houma	1	14	1	3
Manistee	1	7	0	17

The above result is significant if the difference in yield between any two varieties is greater than 19 cwt. per acre in the case of marketable tubers, and 9 cwt. in the case of undergrade tubers.

Kinglake

The deep friable soils of Kinglake, coupled with the high annual rainfall, combine to produce some of the best table potatoes in the State. The variety trial crop was planted on 28th November, 1946, with a dressing of 8 cwt. of superphosphate and ammonia 3:1 per acre.

On the 22nd April, 1947, the earlier varieties were all mature and were lifted, while the late varieties were left until 28th May, 1947, when they had ripened off.

POTATO VARIETY TRIAL, KINGLAKE, 1946-47.

Variety.	Marketable Tubers Yield per Acre.		Undergrades Yield per Acre.	
	Tons Cwt.		Tons Cwt.	
Sequoia	16	18	2	5
Sebago	13	14	2	13
Late Carman ..	13	9	5	3
Katahdin	11	2	2	7
Snowflake	10	9	6	10
Up-to-date	10	6	7	2
Early Carman ..	10	6	3	3
Houma	7	2	2	7
Inverness Favourite	6	10	9	17

The above result is significant if the difference in yield between any two varieties is greater than 1 ton 10 cwt. per acre in the case of marketable tubers, and 1 ton 2 cwt. in the case of undergrade tubers.

Ballarat

The plots in the Ballarat district were planted at Clarke's Hill on 4th December, 1946. The soil is red-volcanic loam and is



Up-to-date.

fairly representative of the area that produces the late potato crop. At planting time, 5 cwt. per acre of superphosphate and ammonia 3:1 was applied to the crop. All varieties were fully matured when harvested, the earlier ones being lifted on 7th May and the late ones on 11th June, 1947. The Snowflakes and Late Carman varieties showed a fair proportion of tubers affected with second growth.

POTATO VARIETY TRIAL, BALLARAT, 1946-47.

Variety.	Marketable Tubers Yield per Acre.		Undergrades Yield per Acre.	
	Tons Cwt.		Tons Cwt.	
Sequoia	15	2	1	13
Late Carman ..	12	4	3	9
Sebago	11	9	1	5
Snowflake	10	8	3	8
Up-to-date	9	19	5	7
Inverness Favourite	8	9	4	6
Katahdin	8	5	0	19
Houma	5	13	2	0
Early Carman ..	5	0	2	5

The above result is significant if the difference in yield between any two varieties is greater than 1 ton 6 cwt. per acre in the case of marketable tubers, and 17 cwt. in the case of undergrade tubers.

As the foregoing results are for one season only, they are presented without recommendation. However, the performance of the new variety, Sequoia, in giving the highest yield in each district is notable. Sequoia is a mid-season to late variety, and forms its tubers rather early in the life of the plant—a characteristic of some of the

modern American varieties—which may account for its eclipse of earlier maturing sorts in the matter of yield.

NOTE.—The author is indebted to Mr. W. A. Downie, B.Agr.Sc., Agricultural Research Officer, for the statistical analyses.

Reference.

(1) Bald, J. G.—A Report on the Agricultural Features of the Australian Potato Industry. C.S.I.R. Pamphlet 106, p. 41.

CERTIFIED PULLORUM-TESTED FLOCKS (POULTRY)

A certified Pullorum Tested Flock is one in which all stock over six months of age have given a negative reaction to the agglutination test for Pullorum Disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector.

The undermentioned flocks have been certified by the Department of Agriculture, and will remain so for the current calendar year, or until such time as the Chief Veterinary Inspector determines.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Particulars of breeds of birds tested are as shown hereunder:—

A. Australorp; B. White Leghorn; C. Rhode Island Red; D. Sussex; E. Langshan;
F. Brown Leghorn; G. Buff Orpington; H. Black Leghorn.

Owner.	Breed.	Number of Birds.	Owner.	Breed.	Number of Birds.
Anguey, H., Hargraves-street, Castle-maine	A	775	Lonie, R. A., 1 Chanak-avenue, East Malvern, S.E.5	B	38
Baker, J. V., Albion-cres., Greensborough	A	699	Maher, Allan E., "Alandale," Wal Wal	B	748
Bantick, K., Old Dandenong-road, Heatherton	A, B	2,375	Major, C. D., Simpson's-road, Eaglehawk	A, B	2,021
Bayfield, A. E., Westell-road, Spring Vale	B, C	1,381	Meier, C. G., "Bylands," Sydney-road, Kilmore	A, D	40
Billman, J. H., Skene-street, Bendigo ..	A, B, C	742	Merrett, A. W., Albert-street, Sebastopol	A, B, C	239
Bray, J., 18 Hotham-street, Warrnambool	B	96	Messrs. T. Milner and Son, Austin-crescent, Pascoe Vale	A, B, E	2,800
Caldar, R. A., Langwarrin ..	A, B	1,135	Molsons White Leghorn Stud, 188 Surrey-road, Blackburn	B	1,089
Cashin's Poultry Farm, Stawell ..	A, B	3,860	Monsant, J., Maiden Gully, via Bendigo	A	1,557
Clements, Wm. H., 7 Crown-road, Ivanhoe, N.21	B, C	60	Moroney, J. B., Kangaroo Flat	A, B	1,670
Coakes, G., Central-avenue, Bayswater ..	B	352	Messrs. R. McCann and Son, Crowlands-road, Stawell	B	3,456
Colquhoun, W. L., "Aringa," Ringwood	A, B	146	McLauchlan, D. F., Rossiter-road, Koo-wee-rup	A, B	2,147
Corbett Bros., Torbay-road, Macleod ..	A	2,458	Niewand, F. J., "Kalang," Lubeck ..	A, B, C	1,556
Dawson, R., Maldon-road, Castlemaine ..	B	1,586	Paton, W. S., Glenburnie-road, Mitcham	A, B	626
Emmott, J. T., Verdon-street, Inglewood	A, B, C	314	Rae, J., 277 Albert-street, Sebastopol, Ballarat	A, B, C	1,679
Frye, I. H., Grimshaw-road, Watsonia ..	A, B	1,996	Robinson, W., 11 Olive-street, Hampton, S.7	C	471
Fullerton, G. H., 57 Just Point, Long Gully, Bendigo	A, B, C	344	Salmund, J. B., Deer Park ..	H	230
Gedye Bros., Railway-road, Blackburn ..	A, B	4,594	Scales, J., West Wattle-tree-road, Boroonia	A	1,382
Giarusso, G., Braeside ..	B	801	Simpson, G. D., May-road, Glen Waverley	B	7,106
Graham, C., "All Black Poultry Farm," Portarlington	A	60	Messrs. W. J. and F. E. Stant, Spring Vale Chick Service, Westall-road, Spring Vale	A, B, C	3,996
Guy, C. J., "Murlea," Murgheboluc ..	A, B, C	557	Swift, D. A., Kangaroo Flat ..	A, B	2,468
Gwyther, R. P., Highton ..	B	1,220	Taylor, H., 119 Rathgower-road, Reservoir	A, B, C	3,171
Hanson, S. H., Box 7, Kilmore ..	A	206	Waugh, A. J., Kangaroo Flat ..	A, B	1,202
Hemphill, A. E., Monegetta ..	A, B	522	Wesley, J. H., Kangaroo Flat ..	A, B, C	1,810
Hewett, A., Central-avenue, Bayswater	B, C	1,415	Wilkinson, L., McKenzie-road, Golden Square	A, B	369
Hewitt's Poultry Farm, Skene-street, Bendigo	A, B, C	1,374			
Hines, B., Box 80, Donald ..	B	425			
Inglis, W., Cobham-road, Mitcham ..	A, B	459			
Jenkins, A. E., Pen-y-bryn, Kallista ..	C	1,076			
Lang, J., 46 Dundas-street, Thornbury ..	E	124			
Messrs. W. A. J. Lintermans and Son, Major-road, Lysterfield	C	879			

MASTITIS

By H. R. TUCKER, B.V.Sc., Veterinary Officer

Mastitis, or inflammation of the udder, may be caused by several different types of bacteria, of which the most common is the *streptococcus*; about 10 per cent. of cases are due to the *staphylococcus*.

These "germs" are commonly found in cowsheds, yards, and pasture, and gain entrance to the udder through the teats after the resistance of the udder tissue has been lowered by certain causes such as faulty machine pressures, blows on the udder from horns or feet, or from contact with logs or gate posts, chills from cold winds, splashing through mud in the cowyard, and through wounds of the teats or udder. They may also be conveyed by milker's hands, contaminated wash-cloths, or milking utensils.

SYMPTOMS OF MASTITIS

The first sign of mastitis is usually an alteration in the milk which may simply become watery or contain thick clots or flakes, or may be tinged with blood. At other times, usually in severe cases, the milk may be pus-like, with sometimes an offensive odour.

The state of the quarter will depend on the severity of the inflammation. There may be little or no change or the quarter may become hot, hard, and painful. The cow usually secretes very little milk in the affected quarter.

In severe cases, the quarter may take on the appearance of a large abscess, discharge freely, or portion may become necrotic and slough away and death may follow.

In the past, treatment of mastitis has been carried out by the introduction into the udder of certain antiseptics such as sulphanilamide, acriflavine, and monacrin. With most of these agents, a certain percentage of cures is made, but none have reached the efficacy of penicillin treatment.

DETAILS OF PENICILLIN TREATMENT

It is proposed to outline in detail the apparatus required and the procedures to be adopted in the treatments of mastitis by penicillin.

At the outset, it is as well to point out that while penicillin is highly efficient against streptococcal infection, it is considerably less so when used against staphylococci.

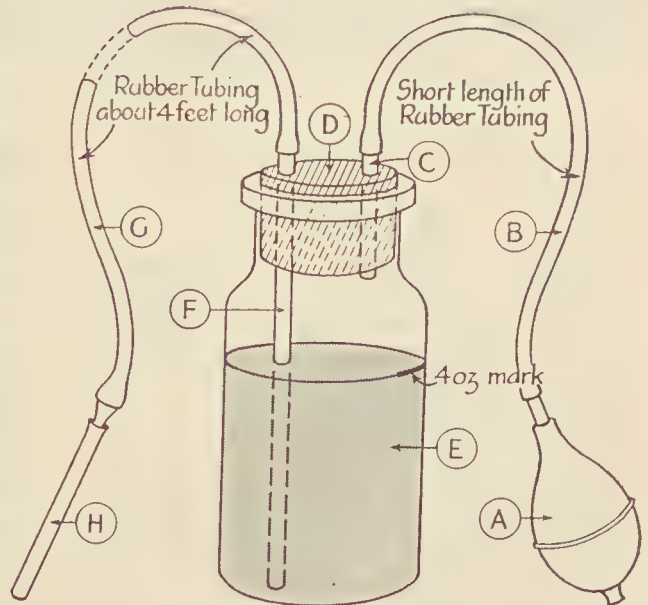


Fig. 1 The apparatus used in Method I for administration of penicillin to the udder.

Method I

The apparatus required consists of the following:—

A.—Rubber bulb to force penicillin solution out of bottle, "E".

B.—A short length of rubber tubing to fit over glass tube "C" and on to rubber bulb "A".

C.—A short length of glass tubing projecting about 1 inch from outside of rubber bottle stopper "D", and just long enough to pass through the stopper to the inside.

D.—Rubber stopper or cork, bored with two holes, to fit tightly into the mouth of

the glass jar. The holes should be just large enough to allow the two pieces of glass tubing ("C" and "F") to penetrate.

E.—A wide-mouthed glass jar or bottle to hold about a cupful of solution. A mark should be made on the outside of the bottle with a file to indicate the 4-oz. level. This may be found by pouring 8 tablespoonfuls (4 oz.) of water into the bottle and making a mark with a file at the level of the water.

F.—A longer length of glass tubing projecting about 1 inch from the outside of the rubber stopper "D", and extending downwards to reach the bottom of the bottle.

G.—About 4 feet of rubber tubing, one end of which fits tightly on to glass tube "F", and the other on to the teat syphon "H".

J.—A short sleeve of rubber tubing to fit over teat syphon during sterilization of the apparatus.

STERILIZATION.

The whole apparatus must always be thoroughly sterilized before use. Disconnect the teat syphon and fit the rubber sleeve over it. A spare syphon fitted with sleeve should be sterilized in case one becomes contaminated during the operation. Also remove the rubber stopper from the bottle with both rubber tubes "B" and "G" and the bulb "A".

Place these articles with the bottle in a clean saucepan or new billycan, cover with clean cold water, put on the lid, bring to the boil and allow to boil for 5 minutes. Remove the lid of the sterilizer, pour off the boiling water, and allow the apparatus to cool down in the container.

It should be noted that this process will apply only to the treatment of one quarter. If more than one quarter requires to be treated, the apparatus (bottle and syphons only) will need to be sterilized again. For this reason, it may be more convenient to have more than one apparatus or to use a larger bottle containing several doses and several teat syphons. 4 oz. represents the dose for the treatment of one quarter only. The teat syphon, of course, should not be used on more than one teat without re-sterilization. otherwise infection may be carried on it from one infected quarter to another.

After sterilizing, one should avoid directly touching with the hands any part of the apparatus which may come in contact with the penicillin solution.

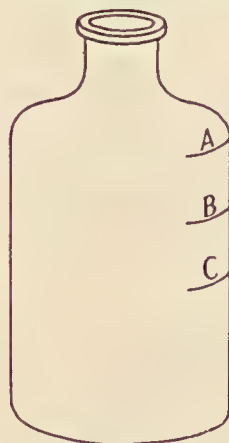


Fig. 2. The Bottle containing the penicillin, marked as described in text.

PREPARATION OF THE PENICILLIN SOLUTION.

Penicillin, as prepared by Commonwealth Serum Laboratories, comes as a yellow powder in small bottles containing 100,000 units. The dose for each quarter is 25,000 units. The bottle has a rubber cap which is kept in position by a band of aluminium.

The aluminium band is forced off with a small, sharp instrument such as a knife blade or a small screw-driver, and the rubber cap can then be lifted off. Before doing this, it is advisable to make three marks on the outside of bottle with a file. The highest will be at the portion where the neck commences, (A), another, (C), should be made half-way down between that and the bottom of the bottle, and the third, (B), half-way between these two. These marks are shown in the diagram, Figure 2.

While sterilizing the apparatus, some water should be boiled in another vessel, e.g., a kettle, and allowed to cool until lukewarm. The bottle containing the penicillin is now filled up with the lukewarm water to the highest mark, "A", the rubber stopper replaced, and the bottle shaken up until all the powder is dissolved.

METHOD OF APPLICATION TO THE UDDER.

Pick the apparatus bottle out of the sterilizer (saucepan, &c.) with clean hands and fill it up to the 4-oz. file mark with the lukewarm-boiled water. Then remove the rubber cap from the penicillin bottle and

clasp the bottle in one hand with the thumb covering the bottle up to the middle mark "B" on the bottle. Carefully pour the penicillin solution into the apparatus bottle until the penicillin level has fallen to the middle mark.

When using it for the second dose, the same procedure is followed, but the thumb covers up to the lower mark "C". The first two doses each represent a quarter of the bottle contents, or 25,000 units of penicillin in each. The third dose represents half the bottle contents, but, in fact, not 50,000 units, as the penicillin deteriorates somewhat rapidly in solution, and by the third day probably does not represent much more than 25,000 units.

If several quarters are to be treated at the same time, it would be convenient to divide the bottle up into four equal portions by making another mark half way between the mark "C" and the bottom of the bottle. This would allow four equal doses of 25,000 units per bottle as the solution would be used immediately and not have time to deteriorate.

If more than one bottle of penicillin is obtained at the same time, bottles not in immediate use should be kept in a cool place, preferably an ice chest.

The apparatus is now assembled, care being taken that no part with which the penicillin will come in contact, is touched by the hands.

ADMINISTRATION OF THE DOSE.

Before administering the dose, it is necessary to wash the udder thoroughly with warm hypochlorite solution ($1\frac{1}{2}$ oz. or 3 tablespoonfuls to 1 gallon of warm water), or with warm soapy water. Milk out the infected quarter into a bucket containing disinfectant. Swab the teat orifice with a clean piece of cotton wool saturated with methylated spirits.

The solution can now be put into the udder in one of two ways—(a) by the force of gravity alone, without the use of the rubber bulb "A" and rubber tubing "B".



Control measures include thorough washing of the udder with soapy water, followed by washing with a hypochlorite solution.

In the gravitation method, an assistant raises the bottle to the full extent of the rubber tube and inverts it. Then remove the rubber sleeve from the teat syphon, and, as soon as the solution commences to flow, control it by pinching the rubber tubing between forefinger and thumb. Now insert the teat syphon carefully up the teat and allow the dose to run in. Then grasp the teat firmly and apply upward massaging action for about 30 seconds to distribute the solution. Always be careful to withdraw the teat syphon from the teat as the last of the penicillin solution is flowing out of the bottle. This will prevent any backflow of infected milk into the delivery tube.

(b) The second method is used when an infected quarter is so swollen and hard that the solution will not flow in by gravity. The rubber bulb "A" is connected to the short piece of glass tubing "C" by the rubber tube "B" as shown in Fig. 1. Then without inverting the bottle, pump in sufficient air to cause the penicillin solution to flow into the quarter. Remember to withdraw the syphon as the last of the solution flows out, and to grasp the teat and massage as above described.

The treatment must be repeated after each afternoon milking, until at least three doses have been given. After use, wash and dry the apparatus and store in a clean, fly-proof and dust-proof container, such as the billycan with lid which was used for sterilizing.



A penicillin tube (actual size) with the screw-cap removed, showing tapered nozzle ready to be inserted in the cow's teat. Be careful not to handle the nozzle.

Method 2

There is now available on the market an oily suspension of penicillin which is available in tubes. These tubes of penicillin are so made that the nozzle of the tube can be inserted into the teat.

DETAILS OF METHOD.

Each tube contains 25,000 units of penicillin suspended in oil. The whole contents of one tube therefore constitute one dose for one quarter. The tubes are capped and sterilized before being filled. The screw cap should not be removed until immediately before the nozzle is to be inserted into the teat orifice.

(a) Wash the udder thoroughly with warm soapy water or with warm hypochlorite solution (1½ oz. or 3 tablespoons of commercial sodium hypochlorite solution to 1 gallon of warm water). Ring out the wash cloth and dry the udder.

(b) Milk out the infected quarter into a bucket containing disinfectant.

(c) Swab the teat orifice with a clean piece of cotton wool saturated with methylated spirits.

(d) With clean hands remove the screw cap from the tube without touching the tapered nozzle.

(e) Hold the end of the teat firmly between finger and thumb and insert the nozzle of the tube gently into the teat orifice. Squeeze in the whole of the contents of the tube. The tube should be squeezed from the base towards the nozzle in order to inject all the contents. Discard the empty tube. Holding the end of the teat firmly to prevent escape of the penicillin suspension, massage the teat upwards several times to distribute the penicillin suspension into the milk cistern.

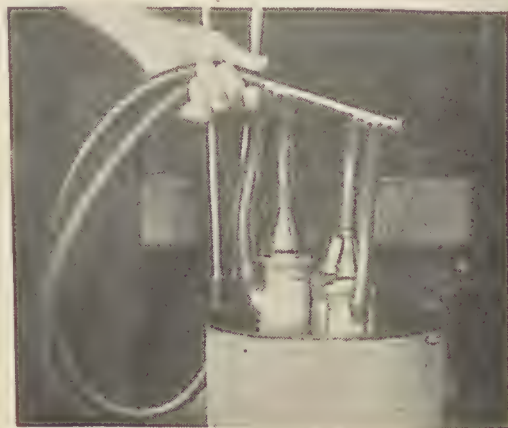
(f) Repeat this treatment after each afternoon milking until at least three doses have been given. (The morning milking may be carried out as usual.)

SHED HYGIENE

In conclusion, a word of warning must be given. The dairy farmer must realize that mastitis cannot be controlled by treatment alone, no matter how efficient the treatment may be.

Complete and adequate shed hygiene is absolutely essential.

As mentioned before, *streptococci* cause the great majority of cases of mastitis, and



Mastitis can be spread by the teat cups. Sterilize the cups in a hypochlorite solution after use on each cow.

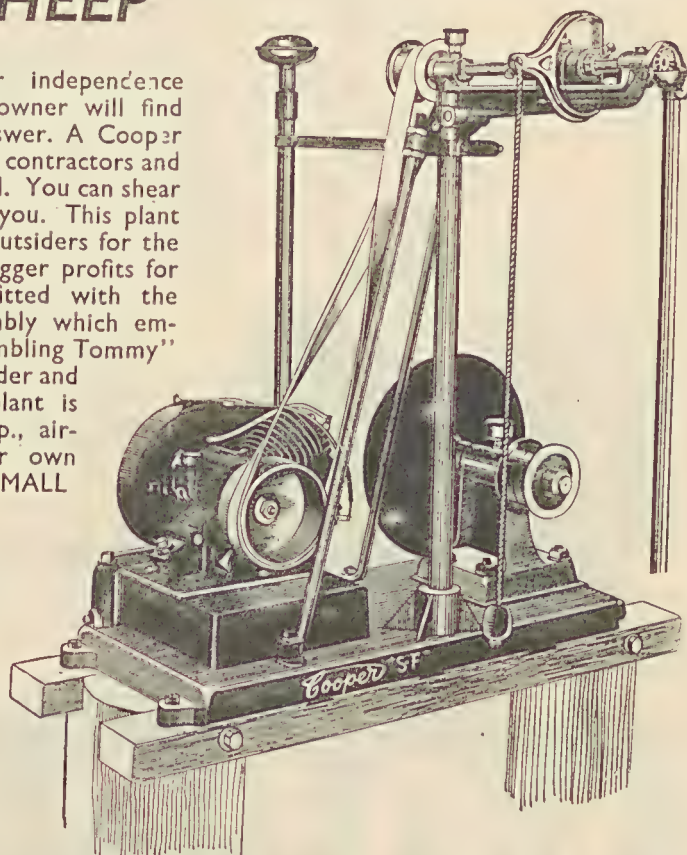
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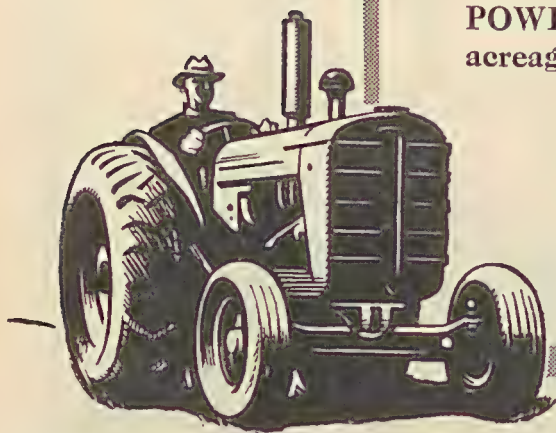


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these germs have been found in cowsheds, on utensils, and generally in the environment of the dairy cow. It is necessary, therefore, that the dairy farmer should concentrate on strict cleanliness and hygienic measures in order to prevent the entry of mastitis germs into the udder of cows.

Keep these points in mind.

The following are points which should be followed as closely as possible :—

(1) Keep to a rigid routine in the milking shed. Milk as rapidly as possible, and do not allow the degree of vacuum to exceed 15 inches. At all times avoid rough handling of the udder, and an important factor in this respect is ensuring that the cups are not left in position too long.

(2) Aim to have the cow's teats and the teat cups of the machine or the hands of the milkers clean and sterile. To do this, wash the teats with warm, soapy water, and then sterilize them with a solution of hypochlorite. Between each cow, the cups must be cleaned and sterilized. Firstly, put the cups in a bucket of warm water containing washing soda (1 dessertspoonful to each gallon), raise and lower them two or three times. Shake off the water and plunge the cups into a bucket of hypochlorite solution, holding them in this for 10 to 20 seconds. Follow the same principles in hand milking.

(3) Keep a careful watch to detect any cows with any of the signs of mastitis. The use of a strip cup on each cow at least once a day is strongly recommended. The strip cup is made by fitting a movable strainer to an ordinary tin pannikin. The brass gauze strainer, 64 mesh, is soldered over an opening in light gauge galvanised plate. A strip is



The use of a strip cup on each cow at least once a day is strongly recommended.

cut from the plate to allow milk to be poured from the pannikin. To provide a shoulder, galvanised wire of 16 gauge is soldered to the upper edge of the plate. The mounted strainer slips on and off the lip of the pannikin to permit ease in washing to remove any solid matter retained on the gauze after each test stripping. Any cow showing signs of mastitis should be milked last. When purchasing cows, be sure they are free from mastitis.

(4) Keep calves and pregnant heifers separated from the milkers as much as possible. Dehorn calves so as to lessen the danger of udder injuries.

(5) When drying off cows, do not practise irregular milking, but dry off abruptly and cut down the food intake of the cow.

There remains much further work on mastitis control to be carried out, but in the meantime the dairy farmer can do much to combat the evils of this disease by careful and strict attention to the hygienic measures outlined above, and by the prompt and intelligent use of penicillin on infected cows.





LIVE STOCK NOTES

Compiled by A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

DEHORNING

THE Ayrshire Cattle Society of Great Britain has decided to permit the dehorning of Ayrshires for three years, and has instructed judges not to penalize dehorned animals in the show-ring. During this period careful observations will be made to ascertain if dehorned cattle produce better and are less temperamental than horned herds. If the trial is satisfactory, general dehorning of the breed may be adopted.

In Victoria, the first private breeder of Ayrshires to dehorn all his cattle was Mr. G. E. Candler, "Writtle," Hamilton, although most of the Ayrshires at the Dookie and Longerenong Agricultural Colleges have been dehorned for some years. Mr. Candler dehorned his herd about twelve months ago and is now disbudding his calves as they are born.

A new method of disbudding is being given publicity at the present time. This is done by destroying the horn buds with a fire-branding iron. The brand is a small circle (O) about the size of a threepenny piece. This is placed over the clipped horn bud.

The operation destroys the horn and is said to be much surer, less painful and more easily performed than dehorning by use of a caustic stick or dehorning paste. The operation can be performed in all weathers and is effective when the calf is a few weeks old, when it is too late to successfully use the caustic stick. There are no after effects. Young goats may also be dehorned by this method.

There is no need to mention the advantages of dehorning as a means of removing danger to both humans and farm stock. Bargower Cherry 29th, champion of the 1947 London Dairy Show, died recently as a result of horning. Local udder injuries due to horning occur daily, while deaths from horning are not infrequent. [A.C.T.H.]

JERSEY BULL FOR WERRIBEE ARTIFICIAL INSEMINATION CENTRE

The young Jersey bull, Glencarne Magnetic Chief, has been purchased from Mr. W. J. Carne, "Glencarne," Pakenham Upper, for artificial breeding at the pilot centre conducted by the Department of Agriculture at Werribee. Semen collected from this

bull will be used to impregnate Friesian-cross heifers artificially bred from grade cows by the two Friesian bulls which have been used during the past three years.

The Jersey bull has been purchased to increase the butterfat percentage of the milk in herds whose owners have co-operated with the Department at the pilot station. Glencarne Magnetic Chief has been selected largely on the production performance of the daughters of his sire, his own half-sisters, nineteen of which averaged 391 lb. of butterfat in the herd of Mr. J. S. Thewlis at Pakenham during 1946-47, and the high butterfat production performances of his other ancestors. The bull is one of good conformation and appearance, as are his parents and grand-parents.

The pedigree of this bull is set out, showing his production backing which is good, particularly when compared with the production of other stock in the same herds tested under the same conditions.

FEEDING PIGS IN THE WINTER

The problem of maintaining pigs during the winter will be difficult for many farmers, as grain and dairy by-products are not

plentiful. Many pig raisers will not be able to maintain growing stock during the winter, but it is to be hoped that they will retain as many of their breeding animals as possible. When culling sows, it is important that those which have shown their ability to rear large healthy litters which have grown quickly to baconer or porker weights should be retained. Gilts from such litters are likely to be more valuable as breeders than gilts which have not grown so well, or young sows which have not produced satisfactorily in their early lactations. However, even when the culls are gone, feeding will present difficulties, and these can be relieved only by good management, and the utilization of every possible food supply to supplement grains, meatmeal and dairy products available.

With the April rains, pasture growth should be fairly good in the warmer districts. This rain will also make it possible to sow cereal crops for grazing.

With a ration of about 4 lb. of concentrates per day plus pasture, or as many pumpkins or roots as they will eat, the sows should reach the spring in a satisfactory condition. If potatoes are available they should be

PEDIGREE OF "GLENCARNE MAGNETIC CHIEF" (C.R.)

Glencarne Magnetic Chief (C.R.)
Born 1st May, 1947.
Bred by W. J. Carne, "Glencarne," Pakenham Upper.

Ovalau Magneto (22205)

In J. S. Thewlis' herd, 19 daughters (3 matures, 3 four-years-old, 5 three-years-old, and 8 two-years-old), averaged 391 lb. butterfat (463 lb. with allowances) in the Pakenham Herd Testing Association in 1946-47

Glencarne Lady Madeira 2nd (1475)

Production performance :—

Milk.	Test.	B.F.	Days.	Age.
lb.	%	lb.		
5,111	6.05	309	273	Junior 2
900	5.96	54	90	Senior 2
8,436	6.22	525	273	Senior 3

Staghorn Laburnum Masterpiece (9036)

In W. H. Waterhouse and Son's herd, 13 daughters averaged 320 lb. butterfat as Junior two-years-old and in 51 lactations averaged 397 lb. butterfat

Navuloa Magnetic (63361)

Production performance :—

Milk.	Test.	B.F.	Days.	Age.
lb.	%	lb.		
8,327	5.54	461	273	Junior 3
7,881	5.43	428	273	Junior 4
7,752	5.77	448	273	Mature
6,275	5.27	331	273	Mature

Wonga Park Ace High (17154)

In W. J. Carne's herd, 6 daughters averaged 333 lb. butterfat on their first lactations and 350 lb. butterfat during 13 lactations, 9 of which were as two-years-old.

Wonga Park Lady Jess (69761)

Production performance :—

Milk.	Test.	B.F.	Days.	Age.
lb.	%	lb.		
8,196	5.43	445	273	Junior 3
10,035	5.61	563	273	Junior 4
10,239	5.53	566	273	Mature
11,288	4.61	520	273	Mature
10,112	5.49	556	273	Mature
9,433	5.09	480	273	Mature
9,927	4.90	486	273	Mature

[A.C.T.H.]

boiled and the grain fed may be reduced to $1\frac{1}{2}$ to 2 lb. per day. With pumpkins and the other roots, however, the concentrate should contain $3\frac{1}{2}$ lb. of crushed grain, and at least $\frac{1}{4}$ lb. of meal, plus an ounce of mineral mixture, which should contain four parts of crushed limestone to one part common salt.

Those possessing some skim milk should spread it throughout the whole herd, giving preference to the younger pigs. Tests have shown that milk fed even at the low rate of $\frac{1}{2}$ pint per pig daily has decidedly beneficial effects on health and growth.

[A. D. NORTH, B.Agr.Sc., Science Field Officer.]

POULTRY BREEDING NOTES

Importance of the Male Bird

A male bird for breeding whether pedigreed or flock bred, should be robust and well matured, with a deep, wedge-shaped breast, straight breast-bone, good abdominal capacity, broad back, hard feathers, large prominent eye, and a straight, well-formed comb.

Hundreds of chickens are sired annually by each breeding male, and it is imperative that only high quality birds be used. Years of careful breeding may be ruined by introducing a male bird with obscure pedigree and ancestry.

When a number of pedigreed males are to be mated to hens whose production records are not known, special quality hens only should be selected, and the best cockerels from these matings used in the breeding pens the following year.

Most commercial poultry farmers are not able to carry out single testing and single mating and unless they introduce pedigreed males occasionally, find it very difficult to maintain profitable flocks. The use of male birds of indifferent quality is probably the reason why so many poultry farmers find it difficult to improve their flocks to any appreciable degree.

The production of infertile eggs is often brought about by running too many males in the breeding pen. Over-mating encourages fighting among the male birds, and often the remedy for fighting and infertility is to reduce the number of males rather than increase it. Remove all birds that are unable to look after themselves, as

it is necessary to maintain law and order in the pens if satisfactory results are to be obtained.

All breeding stock should be in excellent condition and birds should be treated for body lice before being placed in the breeding pens.

[M. D. HALL, Poultry Expert.]

BEEKEEPING

Preparations should now be made to "winter down" apiaries. It is advisable to see that all colonies have a compact brood nest. Remove all surplus empty combs not required by the bees. Place full combs of honey and pollen adjacent to the cluster where it will be within easy reach of the bees during the winter. It takes from forty to sixty pounds of honey to winter a strong colony and carry it in strength until the spring flow arrives.

A check should be made to see that all colonies have laying queens. Any queenless colony should be united with a "queen-right" or normal colony. Place a sheet of newspaper over the cluster of the normal colony; remove the bottom board from the queenless colony and set the hive above the newspaper. The two clusters will unite peacefully after gnawing away the paper.

All colonies light in stores can be helped by giving combs of sealed stores from colonies having a surplus of honey.

Surplus dry combs should be tiered up in supers and made mouse proof. If any wax moths make their appearance, it is advisable to treat the combs with carbon bisulphide.

All hives should be made waterproof, and slightly tilted forward to prevent lodgment of water within the hives upon the bottom boards.

Reconditioning of equipment, and painting should be carried out. Extracting equipment should be thoroughly washed, cleaned and dried before storage. Honey residue allowed to remain on the extractor baskets for any length of time leads to rusting that is extremely hard to remove. Many apiarists thoroughly scour their equipment, and give the extractor and tanks a liberal coating of silver lacquer as a rust preventative.

[W. A. COLLINS, Apiary Inspector.]

Horticultural Research Station Scoresby

TOMATO FIELD DAY

By R. A. MULLETT, B.Agr.Sc., Horticultural Instructor



Visitors inspecting the tomato experimental plots on field day.

THE first field day on tomatoes took place recently at the Department's new Horticultural Research Station, Scoresby. The field day, which was attended by more than 200 growers, including representatives from the major tomato-growing areas, was opened by Sir George Knox, M.L.A., in the absence of the Minister of Agriculture, Col. A. H. Dennett, M.L.A. A vote of thanks to the Department on the work it was doing in the field of tomato research, was proposed by Mr. G. C. Stubbs, manager of a Shepparton tomato factory.

Outlining the importance of the tomato industry to Victoria, the Superintendent of Horticulture, Mr. J. M. Ward, pointed out

that this crop gave a higher financial return to the State than the apple industry. Annual production was about three million bushels of fruit, worth between £700,000 and £800,000, and representing 50 per cent. of the total Australian production.

Explaining the work being carried out at the Station, Mr. B. P. Krone, Tomato Culturist, said that more than 200 tomato varieties are being tested at the Station, and these include new introductions, hybrids, and selections. The objects of the work are the improvement of existing varieties by breeding and selection, and the testing of new varieties from various parts of Australia and overseas.

The plots were planted out early in December. Planting before this time in southern Victoria is not advisable because of the risk of severe damage from the virus disease, spotted wilt. The thrips responsible for the transmission of this disease are more active in the cooler weather of late spring than from December onward.

Twenty plants of each variety were planted out in rows 4 feet apart, with 2 feet between the plants. Notes are made on the characteristics of each variety, especially regarding the incidence of disease. Spotted wilt was severe on some varieties. One variety, Bounty, has not yet shown any infection, but as seed of this variety was obtained from Canada late in the season, the plants were not put out until the end of January, and this freedom from wilt may be due to the late planting.

Routine dusting with a mixed dust containing DDT, sulphur, and copper is recommended. The first dusting should be given when the first fruits have set and grown to about the size of a cherry. A second dusting about a fortnight later should be followed by another in two weeks time, if necessary. All that is required is a thin but complete film of dust over the whole plant.

Varieties on which detailed work is being carried out include :—

South Australian Dwarf

Selection work has resulted in an improved variety named Victorian Dwarf. Seed of this selection is being produced under the Department's new "Approved Seed Scheme".

San Marzano

Hybridizing this variety with Burwood Prize has resulted in a new variety which appears to be immune to Blossom End Rot, one of the main disadvantages of this useful factory tomato.

Orange Prolific

Some useful strains of the Orange Prolific variety have been isolated for future work.

Tatura Dwarf Globe

Selection work has isolated a thick-skinned type of this tomato which appears to be much less susceptible to the cracking and splitting which caused this variety to drop from favour.

Other Varieties

A cross between *Break o' Day* and *King Humbert* has resulted in a useful late variety of the Grosse Lisse type, and this should be useful for late marketing and artificial ripening purposes.

Work is also being done on early varieties for the Murray Valley districts, using *Yellow Top* as one of the parents.

Two overseas introductions of the English cluster type should be of use to metropolitan growers—*Stoner's Exhibition* and *Scarlet Eclipse*. These will stand a great deal of forcing without splitting, and also a great deal of abuse in the ripening room, and are thus specially suitable staking varieties for late-marketing purposes.

A little work has been done to test two substances which are claimed to increase the set of shy-bearing tomatoes. Those used were 2-4D (dichlorophenoxyacetic acid) and β naphthoxyacetic acid. Neither substance was very satisfactory, and the 2-4D caused some malformation of the foliage. More research work will be necessary before these substances can be recommended for commercial use. It appears that it would be better to use a variety which generally carried about 15 to 30 flowers per cluster and set about half of them than to try to get a shy bearer to set all the 5 to 7 flowers this type generally carried.



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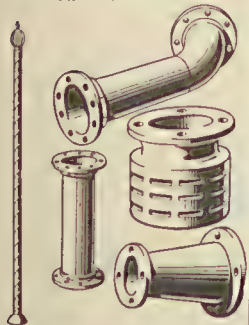


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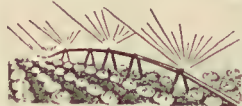
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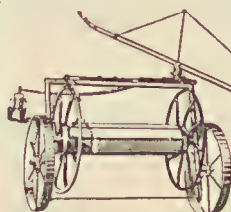
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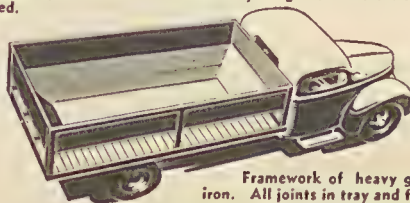
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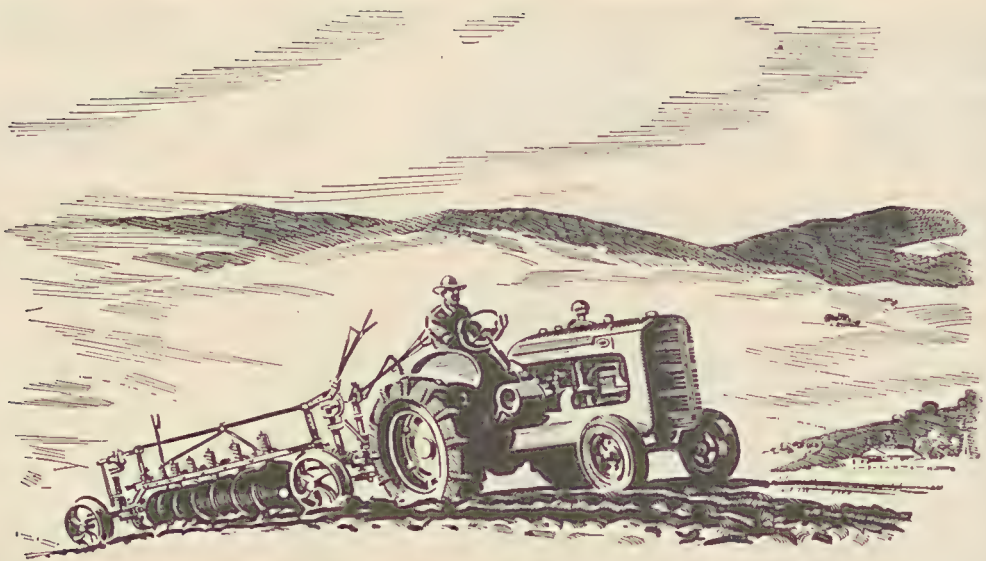
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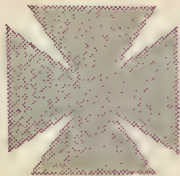


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REGISTRATION OF STALLIONS

Twenty-Eighth Annual Report

By R. J. deC. TALBOT, B.V.Sc., Chief Veterinary Inspector

THE total number of stallions registered under the *Horse Breeding Act* for the year 1947-48 was 255 draughts, 272 light, and 309 pony stallions, a total of 836, which was an increase of 59 over the number registered in the previous year.

The number of draught stallions registered was 26 less than last year, but light and pony stallions increased by 85.

With the increase of mechanization on farms and in industry, heavy-horse breeding had to decline, but it is anticipated that the number of registrations will not fall below the present figure.

The number of foals in respect of which the foal bonus was paid was 150 greater this year than in 1946-47, indicating that more mares were mated in the 1945-46 season than the previous one.

The number of stallions examined by the veterinary staff with a view to registration was 305, comprising 51 draughts, 99 light, and 155 ponies. Of these 25 (8.19 per cent.) were refused registration because of unsoundness; and 30 (9.83 per cent.) because they were considered to be below a reasonable standard of type and conformation. Two hundred and fifty stallions were passed for registration.

TWO-YEAR-OLD COLTS

The *Horse Breeding Act* now provides for the registration of two-year-old colts, the owners of which desire to use them for service.

Owners must make application for registration on the prescribed form, and such application must be accompanied by a fee of £1.

The colts must be submitted for examination by a veterinary officer, and, if passed, will be registered as colts for one year.

During the season 1947-48, 38 colts were examined and 28 were certificated.

EXAMINATION OF MARES

Breeders are reminded that, under a voluntary scheme, stud-book mares may be submitted for examination for soundness. A fee of £1 is charged for the examination, and certificates for soundness are issued for three-year-olds and for four-year-olds, and life certificates for mares over five years.

In the past, many owners have availed themselves of the opportunity of having their mares examined, and it is hoped that, during the coming season, stud breeders will present at least some of their mares for examination.

FOAL BONUS

In 1941, with a view to encouraging the breeding of the best type of draught stock, the Victorian Government decided that a bonus of £2 would be paid to the owners of every foal the progeny of a registered draught stallion and a mare approved by the Chief Veterinary Inspector. In 1946, it was decided to increase the bonus to £4.

Application for the foal bonus should be made to the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

APPEALS

During the year there were three appeals against the decisions of the examining veterinary officers. The Appeal Boards dismissed two appeals and upheld the third.

PARADES FOR THE COMING SEASON

A schedule of parades is not being arranged for this season. Where possible, arrangements will be made to examine stallions at centres most convenient to those owners from whom applications have been received.

Applicants should state which main town would be suitable for them to present their stallions for examination, and they will, in due course, be advised of the date, time, and place arranged for the examination.

Provided owners forward their applications by the 1st July as required, it is felt that, by such an arrangement, every stallion will be examined before the commencement of the breeding season.

Applications for registration must be made on the prescribed forms before the 1st July, and must be accompanied by a fee of £1 10s. (£1 for registration, and 10s. for compensation fee) in respect of stallions fifteen years of age and under, and a fee of £1 1s. in respect of stallions sixteen years or over sixteen years. The necessary forms may be obtained from the Chief Veterinary Inspector, Live Stock Division, Department of Agriculture, Melbourne, C.2.

Changes of ownership must be notified without delay, so that certificates of registration can be endorsed accordingly. Registration expires within 30 days of change of ownership unless the required notice is given.

LIST OF UNREGISTERED STALLIONS RETAINED BY OWNERS FOR USE WITH THEIR OWN MARES.

Under the provisions of the Horse Breeding Act, the owner of any stallion, the registration of which has been refused, may, on payment of a fee of £1 per annum, and notification to the Chief Veterinary Inspector, retain such stallion for breeding purposes with his own mares only.

Name.	*Age and Class.	Owner and Address.	Name.	*Age and Class.	Owner and Address.
Acklom	3 P.	J. R. Smith, Cobains, via Sale	Lord Victor	A. D.	J. Montgomery, Millawa
Allendale	4 L.	A. Funcke, Minyip	Majestic Knight	A. P.	Miss G. Small, Ferntree Gully
Barney	A. P.	H. H. Lewis, Tatong	Marconitch	A. P.	T. Spong, Ascot Vale
Benambra	A. D.	Nankervis Bros., Corryong	Model	A. D.	G. B. Wilson, Tbmboon
Black Mac	4 P.	A. I. R. Blair, Bright	Monty	3 L.	A. J. Treasure, Lindenow South
Black Prince	A. P.	W. K. Thomas, Mt. Cole Creek	Parkly Peter	A. L.	S. S. Moulton, Newry
Black Star	A. L.	D. Madill, Koyuga South	Patches	A. P.	G. E. Clarke, Bulla
Boy Caledon	A. T.	Naughton Bros., Omeo	Prince	A. D.	A. H. Fawson, Bainsdale
Brilliant Steel	A. T.	G. Austin, Jnr., Frankston	Punch	A. D.	W. Earl, Woodside
Cannoneer	5 L.	I. H. Burnett, Won Wron	Riversdale Hopetown	3 D.	T. Makeham, Lalbert
Dandy	4 P.	A. F. Kellert, Allstree	Sand Storm	A. L.	W. R. Cato, Sale
Dark Globe	A. L.	A. D. Thompson, Kyabram	Skylark	A. P.	J. Skehan, Sale
Devon Point	A. L.	J. Manifold, Weerite	Smart Lad	A. T.	H. Dunbar, Traralgon
Ethaldale Scotson	A. D.	H. H. T. Kramer, Lawloit	Star Bruns	3 L.	P. N. Dunstan, Swan Hill
Flash	A. P.	A. F. Saunders, Sale	Sylvester Ronald	A. D.	T. G. Parker, Boort
Galopa	A. T.	A. Kane, Tallarook	The Vanquisher	A. T.	E. J. Gleeson (Estate), Macarthur
Golden Glory	4 P.	D. W. Battarbee, Warrnam-bool	Valetta Benbold	3 D.	H. S. Nottle, Netherby
Goldie	5 P.	J. L. Sullivan, Whitelaw	Victory, V.	3 P.	J. H. Rogers, Traralgon
Joe Wallace	4 D.	E. A. Bradbury, Nullawil	Wee Jackie	3 P.	A. B. Cecini, St. Arnaud
John McEldwyn	A. P.	D. Bamford, Beac	Unnamed	A. L.	J. J. Cleland, Mulwala, N.S.W.
Just Addition	4 P.	A. Newey, Mirboo North	Unnamed	3 P.	W. D. Cox, Cowwarr
Ko-Warra Robert	A. D.	R. S. Smith (Estate), Echuca	Unnamed	A. L.	W. Pearson, Creightons Creek
Little Prince	A. P.	G. E. Clarke, Bulla	Unnamed	A. P.	C. Sargeant, Geelong West

* NOTE.—Age in years. A. aged; D. draught; L. light; P. pony; T. thoroughbred.

SUMMARY OF STALLION EXAMINATIONS, 1947-48.

	Draught.		Light.		Pony.		Total.	
	Examined.	Certificated.	Examined.	Certificated.	Examined.	Certificated.	Examined.	Certificated.
	51.	33.	99.	78.	155.	139.	305.	250.
	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.
Bone Spavin	1	1.96	5	5.05	4	2.58	10	3.278
Bog Spavin	1	1.96	1	1.01	..	..	2	0.655
Ringbone	3	5.88	..	..	2	1.29	5	1.639
Sidebone	4	7.84	..	..	..	..	4	1.310
Curb	..	..	2	2.02	1	0.645	3	0.983
Stringhalt	..	..	1	1.01	..	..	1	0.327
Unsoundness	9	17.64	9	9.09	7	4.515	25	8.19
Disapproval	9	17.64	12	12.12	9	5.806	30	9.834
Total	18	35.28	21	21.21	16	10.321	55	18.024

SUMMARY OF STALLION EXAMINATIONS, 1946-47.

	Draught.		Light.		Pony.		Total.	
	Examined.	Certificated.	Examined.	Certificated.	Examined.	Certificated.	Examined.	Certificated.
	47.	35.	73.	58.	116.	102.	236.	195.
	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.
Bone Spavin	..	..	1	1.37	..	..	1	0.42
Ringbone	..	..	2	2.74	3	2.59	5	2.12
Sidebone	6	12.76	..	..	..	..	6	2.54
Curb	1	2.13	2	2.74	2	1.72	5	2.12
Chorea (Shivering) ..	1	2.13	..	..	..	..	1	0.42
Through Unsoundness ..	8	17.02	5	6.85	5	4.31	18	7.62
Through Disapproval ..	4	8.51	9	12.33	9	7.76	22	9.32
Total	12	25.53	14	19.18	14	12.07	40	16.94



CODLING MOTH CONTROL

DDT Trials in the Goulburn Valley

By R. M. STEPHENS, B.Sc., Assistant Entomologist, Biological Branch

A further season of experiment and observation on the control of codling moth with DDT has conclusively demonstrated the phenomenal effectiveness of this insecticide.

The use of DDT by growers, involving the treatment of large areas, has shown that three sprays in one season can reduce the infestation level to less than 1 per cent. Observations indicate that it may be possible to maintain this low level of infestation with even fewer sprays.

In so far as this district is concerned there have not yet been any serious complications due to mite infestation. Bryobia Mite (*Bryobia practiosa* Koch) has been adequately controlled by a thorough dormant red-oil spray. In an emergency, however, summer spraying with HETP (Hexaethyltetraphosphate) can be expected to give control for both Bryobia and Red Spider (*Tetranychus urticae* Koch).

It has been noted that where the use of lead arsenate has been completely abandoned and where no DDT has been applied in the midseason period, there has been an increase in the population of Light-brown Apple Moth (*Tortrix postvittana* Walk.). One spray of lead arsenate at the usually recommended strength in midsummer should be all that is required to control this pest.

Time of application and number of sprays used by orchardists have been varied, although in general the timing has been a rough approximation to that used for lead arsenate. In particular, information on the time of application of the first spray in relation to moth emergence is required, for it has been evident for some time that the so called "calyx" spray is not necessary where DDT is used.

The object of this season's experiments was to obtain further data on the number of sprays and the concentration of DDT,

and to find the optimum timing for the first spray.

KYABRAM AND SHEPPARTON EAST Schedule and Concentration

The plots in these two districts were duplicate halves of the one experiment. Williams' Bon Chretien pears were chosen in two blocks of 288 trees each. The two blocks were very similar in spray history, infestation level, age, and apparent health. No DDT had been used previously on either property, but, for this season, the Shepparton East grower changed completely over to DDT, while the Kyabram grower still used lead arsenate.

The experimental areas consisted of eighteen plots of sixteen trees each, representing three duplicates of six treatments, and the four centre trees of each plot were used for assessing results. The spray material used was a proprietary DDT paste containing 36 per cent. w/w of para para isomer of DDT and white oil.

TABLE 1.—SHOWING CODLING MOTH DAMAGE
TO WILLIAMS' BON CHRETIEN PEARS
AT KYABRAM AND SHEPPARTON EAST.

Kyabram.

Treatments.	Total Number of Fruits.	Per- centage Damage.
1. Two applications of 0.1 per cent. DDT	2,678	4.04
2. Three applications of 0.1 per cent. DDT	3,441	2.52
3. Three applications of 0.1 per cent. DDT	2,745	1.93
4. Two applications of 0.05 per cent. DDT	3,038	8.45
5. Three applications of 0.05 per cent. DDT	3,607	5.81
6. Three applications of 0.05 per cent. DDT	2,867	5.71

TABLE 1.—*Continued**Shepparton East.*

Treatments.	Total Number of Fruits.	Percentage Damage.
1. Two applications of 0.1 per cent. DDT	2,934	1.46
2. Three applications of 0.1 per cent. DDT	1,707	0.35
3. Three applications of 0.1 per cent. DDT	2,811	0.10
4. Two applications of 0.05 per cent. DDT	1,536	3.25
5. Three applications of 0.05 per cent. DDT	1,790	1.95
6. Three applications of 0.05 per cent. DDT	2,993	0.26

Treatments 1 to 6 were all sprayed at the same time for the first two applications, namely, October 21st and November 5th. Treatments Nos. 3 and 6 were to have been four-spray schedules, but, owing to wet weather at the time the third spray should have been applied, these now become duplicates of Treatments 2 and 5 respectively.

Statistical examination shows the treatment effects to be highly significant, i.e., that 0.1 per cent. DDT is much better than 0.05 per cent. DDT and that three sprays are much superior to two sprays for either concentration.

The significantly higher level of infestation on the Kyabram block may be attributable to the high level of infestation in the surrounding trees which had been sprayed with lead arsenate.

Chlorotic mottling was very definite on these blocks, particularly at Shepparton East, adding support to the contention that oil even in small quantities should not be included in a DDT programme.

ARDMONA**Variation of Time of First Spray**

Packham's Triumph pear trees were selected for the experiment to determine the relationship between moth emergence and the timing of the first spray.

The experiment consisted of a latin square of five replicates of five treatments using 16-tree plots. The four centre trees were used to assess the results. The first

treatment was the earliest application, and this coincided with the petal fall period, that is, the time for the normal "calyx" spray. Each of the other treatments were applied with intervals of a week between each one so that Treatment No. 5 was four weeks after petal fall. From then on, the area was treated in exactly the same way as the remainder of the orchard. Two further sprays were applied, one early in December, and the other early in January, making a total of three applications for all the treatments.

The DDT used was in the form of a commercial dispersible powder containing 50 per cent. w/w para para isomer of DDT.

TABLE 2.—SHOWING CODLING MOTH DAMAGE TO PACKHAM'S TRIUMPH PEARS.

Ardmona.

Treatments (Time of First Spray).	Total Number of Fruits.	Percentage Damage.
1. DDT 0.1 per cent. October 21st	4,657	2.43
2. DDT 0.1 per cent. October 29th	3,947	2.22
3. DDT 0.1 per cent.. November 5th	5,265	1.82
4. DDT 0.1 per cent. November 12th	5,933	3.16
5. DDT 0.1 per cent. November 19th	5,139	5.80

Statistical analysis shows that the effect of time of spraying on infestation may be represented by a quadratic curve, the trend of which is highly significant.

Fig. 1 represents a comparison of the codling moth lure catch (as a weekly average from ten pots on each of six properties) with the percentage infestation obtained by variation of the first spray, over the same period of time.

It would appear that the optimum time for the application of the first spray corresponds with the first major peak of moth emergence from overwintering larvae, but the time is not extremely critical, and for this last season for any variety of pear in the Goulburn Valley, the first spray could have been applied with safety at any time from petal fall until November 10th, with the optimum in the week ending November 5th.

SUMMARY

In the experimental work described it has been shown that efficient control of codling moth has been obtained with a schedule of three sprays of DDT at a concentration of 0.1 per cent. DDT. This programme is significantly superior to either two sprays of 0.1 per cent. or three sprays of 0.05 per cent. under the same conditions.

It has also been demonstrated that the optimum time for the application of the first spray was in the eight days following the first major peak of emergence.

ACKNOWLEDGMENT

The co-operation of Messrs. Newman, McNab, and Hull, on whose properties the experimental blocks were located, is gratefully acknowledged. The assistance given by the Orchard Supervisors in the two districts is also greatly appreciated.

Statistical analyses were made, by Mr. E. J. Williams, of the Section of Mathematical Statistics, Council for Scientific and Industrial Research.

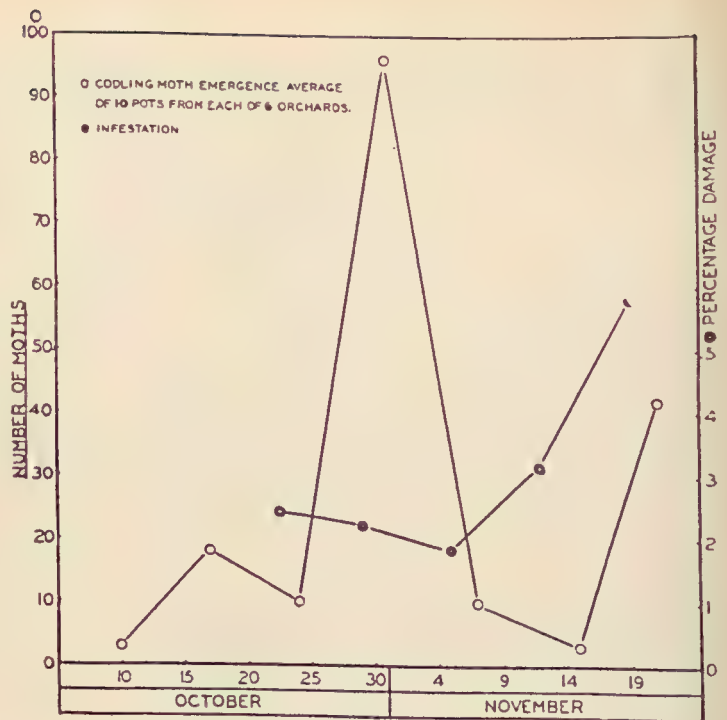


Fig. 1.—Showing codling moth lure catches and percentage infestation over the same period of time.

Rapid and Efficient Milking Essential

The udder of the cow is a spongy, elastic organ, each quarter of which consists of innumerable tiny milk sacs connecting with several ducts opening into a cavity known as the milk cistern, which again connects with the teat canal.

The pressure of milk within the udder rises gradually from one milking to the next, but at the commencement of milking there is a sudden increase in pressure, causing distension of the udder and teats by the "letting down" of the milk from the milk ducts. This "letting down" process is induced by the secretion of a hormone from the pituitary gland into the blood stream.

Placing food in the bails, and especially the handling and bathing of the udder induce this "letting down" of the milk. It takes about forty seconds for the hormone to travel from the pituitary gland to the udder via the blood stream, and it acts for only a limited time. It is advisable, therefore, to commence milking within one minute of

washing the cow's udder, and to complete milking as quickly as possible while the "let down" process is at its maximum. It is preferable to wash each cow's udder individually, and commence milking immediately, rather than adopt the practice of washing the whole line of cows at one operation.

Operations in and about the milking shed should be conducted quietly and in a routine manner, as any disturbances, unusual sights or sounds likely to upset the cow cause the secretion of another hormone which interferes with the action of the "let down" hormone, and reduces the milk supply.

Most cows can be trained to let down all of their milk to machine milking without any hand stripping. If the teat cups "crawl" when the udder is nearly empty, apply gentle pressure with the hand to pull the cups downward.

[Contributed by the Dairying Division.]

SEED POTATO CERTIFICATION

List of Growers, 1948

By W. A. DOWNIE, B.Agr.Sc., Agricultural Research Officer.

A LIST of growers of seed potatoes, whose crops conform to the standard of purity and freedom from disease required under the Seed Potato Certification Scheme is appended. These crops have been inspected at least twice in the field and the potatoes obtained from them may be sold as "Certified" seed provided they comply with the Grade Standard for seed potatoes and are contained in sealed bags bearing an official label.

A feature of the crops submitted in all districts was the number showing diseased plants resulting from the attack of the causal organism (*Bacterium solanacearum*) of Bacterial Wilt. The variety, Sebago, has shown the greatest degree of infection. As the principal means of spread of this disease is the planting of infected seed, great care has been taken to ensure that only those crops which are free from plants affected with Bacterial Wilt at the time of final inspection have been accepted for certification.

Growers of seed potatoes in the Central Highlands are requested to note that, in

future, the varieties Early and Late Carman grown in that area will not be accepted for certification. Experience over a number of years has shown that these varieties, when sown in that area, rapidly become severely affected by virus diseases despite careful roguing and supervision.

Those growers who have been permitted to retain a portion of a variety for their own use for future inspection for certification are not, as is the usual custom, shown in the list.

Mention is also made of the fact that a small stock of the new variety, Sequoia, appears in the list. This stock has been multiplied by Messrs. J. Knox and Son, Weeaprounah, in conjunction with the Department of Agriculture. Applications from persons who desire to obtain seed of this variety should be addressed to the Potato Section of this Department. It should be noted, however, that established growers of certified seed potatoes will be given preference if the quantity applied for exceeds the volume of seed available for distribution.

LIST OF GROWERS OF PROVISIONALLY CERTIFIED SEED POTATOES, 1948.

Name.	Address.	Acres.	Name.	Address.	Acres.
EARLY CARMAN.			LATE CARMAN.		
Allan, J. M. and R. ..	"Inverlair," Whelan's L.B., via Leongatha ..	11	Brady, E. J. ..	Pheasant Creek, via Whittle- sea ..	15
Collery, Jas. ..	Kerrie P.O., via Romsey ..	3	Brown, V. L. ..	Wyealunga, via Colac ..	2
Coulter, W. J. and R. I. ..	McKinnon's P.O., via Leongatha ..	1½	Butler, J. ..	Weeaprounah, via Colac ..	1
Kuhne, C. T. ..	McKinnon's P.O., via Leongatha ..	7	Coate, W. T. ..	Lancefield ..	5
Morter, H. and T. ..	Leongatha ..	7	Congram, W. J. P. ..	Beech Forest, via Colac ..	2
McGrath, W. J. and Sons ..	Stony Creek ..	6	Ebbels, J. T. ..	Ollinda ..	7
McIndoe, R. E. ..	Leongatha ..	16	Exton, Arnold, and Sons ..	Kinglake, via Whittlesea ..	12
McKenzie, I. N. ..	Whelan's L.B., via Leongatha ..	3	Exton, Chas. and Sons ..	Kinglake Central, via Whittle- sea ..	73
Powell, H. and Sons ..	Thorpdale ..	20	Francis, J. E. ..	Ferguson, via Colac ..	8
White, J. and Son ..	"Elnaam," Neerim ..	3	Grimwood, R. ..	Laver's Mill, via Colac ..	8
White, R. T. ..	13 Balr-street, Leongatha ..	3	Haney, D. W. ..	Kinglake, via Whittlesea ..	2

LIST OF GROWERS OF PROVISIONALLY CERTIFIED SEED POTATOES, 1948—continued.

Name.	Address.	Acres.	Name.	Address.	Acres.
LATE CARMAN—continued.			SEBAGO—continued.		
Hansen, H. T. ..	Ferguson, via Colac ..	5	Brown, V. L. ..	Wyelangta, via Colac ..	4
Hawkins, E. T. ..	Kinglake, via Whittlesea ..	9	Butler, J. ..	Weeaprounah, via Colac ..	6½
Minchinton Bros. ..	Ferguson, via Colac ..	15	Cartlere, J. ..	Wyelangta, via Colac ..	7
Minchinton, E. A. ..	Weeaprounah, via Colac ..	3	Ciancio Bros. ..	Wyelangta, via Colac ..	2
Minchinton, E. F. and Son ..	Beech Forest, via Colac ..	10	Coltery, John ..	Heskett P.O., via Woodend ..	8
Morrow, A. C., and Joiner, G. A. ..	Beech Forest, via Colac ..	11	Deppeler Bros. ..	Beech Forest, via Colac ..	12
Murchison, A. M. J. ..	Ferguson, via Colac ..	5	Dow, R. and W. ..	Ferguson P.O., via Beech Forest ..	12
McMahon, J. P. ..	Kinglake, via Whittlesea ..	6	Dye, A. ..	Gembrook ..	4
Nation, E. A. ..	Weeaprounah, via Colac ..	3	Eades, W. H. ..	Thorpdale South ..	3
Reeves, S. A. ..	Kinglake East, via Whittlesea ..	12	Exton, Chas. and Sons ..	Kinglake Central, via Whittlesea ..	5
Simmons, J. C. ..	Wyelangta, via Colac ..	3	Francis, J. E. ..	Ferguson, via Colac ..	2
Toohey, T. J. ..	Kinglake, via Whittlesea ..	24½	Frost, E. T. ..	Stony Creek ..	3
Toohey, J. ..	Kinglake West, via Whittlesea ..	4½	Gardner, R. W. ..	Beech Forest, via Colac ..	5
Towers, A. J. ..	Beech Forest, via Colac ..	9	Gilbert, H. T. ..	Amey's Track, via Foster ..	1
White, J. and Son ..	"Elnaam," Neerim ..	4	Grosse, H. G. ..	Beech Forest, via Colac ..	12
Young, A. E. ..	Beech Forest, via Colac ..	6	Gunther, T. H. ..	Hazeldene, via Glaysdale ..	3
Young, R. and A. ..	Weeaprounah, via Colac ..	1	Hansen, H. T. ..	Ferguson, via Colac ..	2
KATAHDIN.			Hawkins, E. T. ..	Kinglake, via Whittlesea ..	9
Boustead, A. C. ..	Dean ..	10	Hobson, J. T. ..	Laver's Hill, via Colac ..	4
Breen, J. P. ..	"Hazeldean," Gembrook ..	3	Jones, A. R. ..	"Treforest," Warragul ..	3
Butler, J. ..	Weeaprounah, via Colac ..	4	Kelly, C. ..	Gembrook ..	2
Campbell, D. S. ..	"Argyle," McKinnon's-road, Leongatha ..	1	Knox, J. and Son ..	Weeaprounah, via Colac ..	20
Coltery, Jas. ..	Kerrie P.O., via Romsey ..	11	Labbett Bros. ..	Clark's Hill ..	18
Coltery, John ..	Heskett P.O., via Woodend ..	11	Miles, I. C. ..	Stony Creek ..	3½
Dye, A. ..	Gembrook ..	2	Miller, G. L. ..	Amey's Track, via Foster ..	1
Eades, W. H. ..	Thorpdale South ..	1	Minchinton Bros. ..	Ferguson, via Colac ..	12
Exton, Chas. and Sons ..	Kinglake Central, via Whittlesea ..	12	Minchinton, E. A. ..	Weeaprounah, via Colac ..	8
Frost, E. T. ..	Stony Creek ..	2½	McGrath, W. J. and Sons ..	Stony Creek ..	7
Gardam, R. T. ..	Dumbalk ..	3	McKenzie, A. ..	Wyelangta, via Colac ..	4½
Ginn, R. J. ..	Gembrook ..	4	McMahon, J. P. ..	Kinglake, via Whittlesea ..	2
Gunther, T. H. ..	Hazeldene, via Glaysdale ..	6	Nation, E. A. ..	Weeaprounah, via Colac ..	1
Kelly, C. ..	Gembrook ..	3½	Powell, H. and Sons ..	Thorpdale ..	7
Knox, J. and Son ..	Weeaprounah, via Colac ..	10	Puls, A. B. ..	Beech Forest, via Colac ..	3
Miles, I. C. ..	Stony Creek ..	14½	Pyle, H. ..	Dumbalk ..	3
McGrath, W. J., and Sons ..	Stony Creek ..	7	Renzella, C. ..	Weeaprounah, via Colac ..	8
McKenzie, A. ..	Wyelangta, via Colac ..	2	Renzella, N. A. ..	Weeaprounah, via Colac ..	4
Sale, V. J. ..	Glaysdale ..	15	Shackleton, H. G. ..	Thorpdale ..	4
Sinclair, E. S. ..	Stony Creek ..	5	Simmons, G. J. ..	Wyelangta, via Colac ..	6
Stielow Bros. ..	Gembrook ..	15	Sinclair, E. S. ..	Stony Creek ..	15
Stielow, I. ..	Gembrook ..	10	Skinner, F. T. ..	Ferguson, via Colac ..	6
Ure, A. W. ..	Gembrook ..	3	Tann, W. H. ..	Weeaprounah, via Colac ..	16
Wilson, I. W. ..	Neerim Junction ..	4	Taylor, T. V. and R. C. ..	Hoddle's Creek ..	4
UP-TO-DATE.			Tjibbits, J. M. ..	Wyelangta, via Colac ..	1½
Baulch, S. G. ..	Beech Forest, via Colac ..	8	Toohey, D. J. ..	Pheasant Creek, via Whittlesea ..	2½
Brown, C. D. ..	Wyelangta, via Colac ..	2	Toohey, L. F. ..	Kinglake, via Whittlesea ..	3½
Butler, J. ..	Weeaprounah, via Colac ..	2	Toohey, T. J. ..	Kinglake, via Whittlesea ..	6½
Deppeler Bros. ..	Beech Forest, via Colac ..	8	Towers, A. J. ..	Beech Forest, via Colac ..	3
Minchinton, E. A. ..	Weeaprounah, via Colac ..	16	White, J. and Son ..	"Elnaam," Neerim ..	9½
Minchinton, E. F. and Son ..	Beech Forest, via Colac ..	8	Williams, G. L. ..	Lusatia Park, Woori Yallock ..	3
Murchison, A. M. J. ..	Ferguson, via Colac ..	5	Willis, A. T. ..	Hoddles Creek ..	12
McMinn, H. G. ..	Wyelangta via Colac ..	4	Wilson, I. W. ..	Neerim Junction ..	5
Skinner, F. T. ..	Ferguson, via Colac ..	1½	Young, A. E. ..	Beech Forest, via Colac ..	1
Tann, W. H. ..	Weeaprounah, via Colac ..	4	SNOWFLAKE.		
Young, A. E. ..	Beech Forest, via Colac ..	1	Boadle, L. H. ..	Claretown ..	17
SEBAGO.			Boustead, G. and I. ..	Dean ..	20
Amey and Wisewould ..	Jindivick ..	4	Labbett Bros. ..	Clark's Hill ..	11
Baulch, R. M. and H. J. ..	Stalker, via Colac ..	12	Toohey, J. ..	Kinglake West, via Whittlesea ..	8
Brown, D. B. ..	Wyelangta, via Colac ..	2½	Toomey Bros. ..	Trentham ..	35
SEQUOIA.			SEQUOIA.		
			Knox, J., and Son ..	Weeaprounah, via Colac ..	2

RABBIT SKINS

SKINNING · STRETCHING ·

& STORING.



By A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

AS rabbits are particularly destructive to most crops, including pasture, and compete with farm animals for feed, their control is essential in the interests of farming. The control of rabbits is administered by the Vermin and Noxious Weeds Branch of the Lands Department, and landholders are expected to co-operate with district inspectors in this respect. It is obligatory for farmers and other landholders to destroy rabbits on their properties, but, when rabbit skins and rabbit carcasses are selling well, it is possible to make the rabbits pay for their own control.

Rabbits are classed as vermin, and many landholders do not realize that their skins and carcasses are often very valuable. Rabbiting is frequently left to boys who are allowed to keep the revenue from skins as pocket money. During the past seven or eight winters, some farmers have made as much as £30 per month from rabbit skins caught as a side-line to their other farming activities.

This article is written to give some idea of the best way to skin the rabbits, and stretch and store the skins so that the amateur may obtain the best price for them.

CLASSES OF RABBIT SKINS

Rabbit skins are classed into Winters, 1st and 2nd Incomings, Autumns, Racks, Light Racks, Three-quarter Grownns, Half-grownns, Does, Kittens, and Smalls, with Does and Pelts being graded according to the first five mentioned qualities. It should be remembered that a border line skin properly skinned, stretched, and stored will go usually into the higher class, whereas the badly-stretched one will go into the lower class which may be several pence per pound cheaper.

In addition to the above classes, there are butchered and damaged skins. Butchered skins are from gutted rabbits, whereas damaged skins have been torn, or are badly stretched, blood stained, weevily, sweated, &c. Butchered skins are classed into

butchered pelts, winters, &c., but damaged skins are classed as 1st damaged, 2nd damaged, and so on. As damaged skins comprise a large proportion of the skins received, and as most of the damage is caused by neglectful skinning, stretching, or storing, much money is unnecessarily lost as a result. Blood stains from shooting are usually sufficient to put the skins into damaged classes. Nevertheless, it still pays to skin and stretch such skins properly.

SKINNING

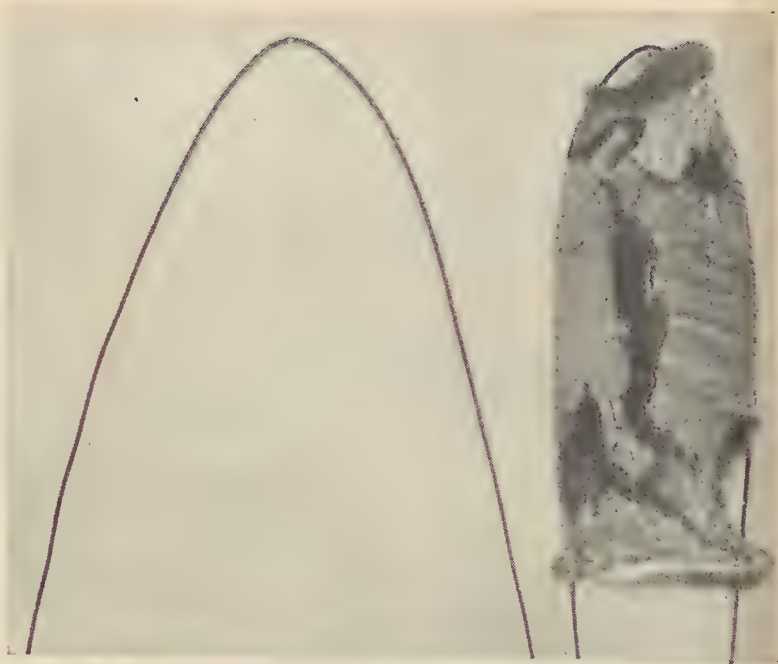
Skins should be sleeved. This is done by cutting the skin down the inside of both hind legs to the crutch just under the tail, with a sharp pointed or skinning knife.

The skin is then carefully removed by the hands and fingers, first by taking it from the hind legs and as far down to the toes as possible in order to allow the legs to be tied easily and securely round the wire on which the skin is stretched. The skin is then pulled over the carcass, turning it inside out in the process. The front legs are pulled out and the skin cut off behind the ears. Care should be taken that the skin is not torn anywhere in the process. The most likely places to tear it are at the navel and front legs. If torn, the skin immediately becomes damaged. The heads should not be skinned.

STRETCHING

The skin should be stretched on a well-shaped wire made from a straight piece of No. 8 gauge wire, galvanised for preference. The wire should be at least 3 feet long. When the wire is bent, the ends should be at least 12 inches apart, so that there will be sufficient spring in the wire to stretch the skin properly. A well-stretched skin from a full-grown rabbit should be about 6½ inches wide and 16 inches long.

A wire and a well-stretched skin are shown in the accompanying photograph. Care should be taken when making the wires



A well-shaped wire and a properly-stretched skin.

to see that they are the correct shape and size. Before bending, the wire should be straight and free of kinks. Smaller wires are required for kittens' skins, whereas hare skins should be stretched on larger wires.

The skin should be placed carefully on the wire so that the centre of the back touches one side of the wire and the centre of the belly the other. The skin is kept in position by tying the hind legs together as shown in the illustration.

BADLY STRETCHED SKINS

A visit to a fur store will show that thousands of rabbit skins are badly stretched. Many of the skins have been stretched on badly-made wires. The wires are frequently too narrow, too pointed at the top or too square at the top. All wires should be regularly examined and bent into the right shape. Small wires should be set aside and used only for kittens. In the illustration samples of badly-stretched skins are shown, and the reasons for the bad stretching are given. A well-stretched skin is shown for comparison.

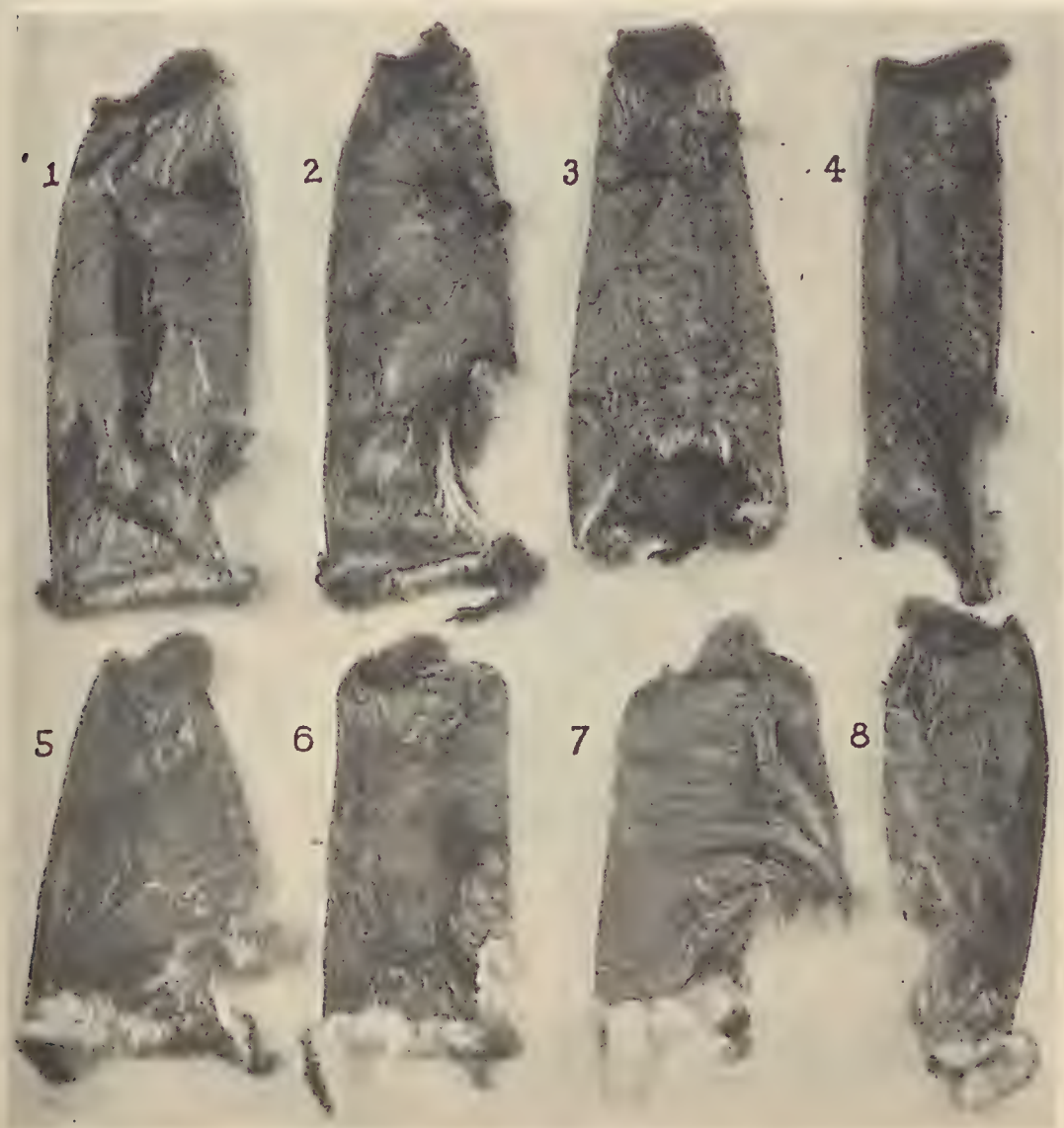
The disadvantages of stretching skins the "old way", that is, by tying the rear legs in front of the skin, are that grease runs off the belly on to the good back fur, which is exposed where the legs are tied, and also that the skin is harder to cut open as it is more difficult to run a knife straight up the centre of the belly than when the skin is folded along the centre of the belly as in the modern method.

DRYING

Rabbit skins should be dried on the wire, under cover from direct sunshine, damp weather, and out of reach of cats, dogs, rats, and other vermin.

STORING

When thoroughly dry, skins should be stored in a dry place away from rats, mice, and weevils. No skins should be packed



1. A well-stretched skin. The remaining skins have been damaged by—2, careless crutch gutting; 3, use of old method of stretching; 4, use of narrow wire; 5, not being fully stretched; 6, stretching on badly-shaped wire; 7, legs being left untied and use of badly-shaped wire; 8, by use of badly-shaped wire, crutch gutting, and leaving legs too short to tie properly.

away or consigned unless thoroughly dry. Weevils can be controlled by spraying or painting the skins with sodium arsenite solution, made by mixing 1 lb. of sodium arsenate in 4 gallons of water. This solution is poisonous and should be stored away from children and farm animals. Once properly sprayed or painted, the skins will always be free of weevils.

Weevils also may be destroyed by fumigating skins with carbon disulphide. The skins should be put into an airtight container or drum with a tight-fitting lid or damp bag over the top. A small open bottle of carbon disulphide may then be placed amongst the skins. The carbon disulphide evaporates, penetrates the skins, and poisons the weevil grubs, pupae or crysalids, and beetles, but not the eggs. These may be destroyed by a second fumigation. Skins so treated are liable to become re-infested. Weevils may also be controlled by dusting with DDT. Skins should not be painted with sheep dip, since skins treated

and early August. It seldom pays to keep skins and sell them out of season.

Skins always should be sold through reliable agents or to reputable skin buyers.

USES OF RABBIT SKINS

Practically all of the damaged skins, kittens, does, and summer racks are purchased by hatters for the manufacture of felt hats. The three-quarter and half-grown skins and portion of the racks are usually purchased by furriers for the manufacture of fur linings for gloves, boots, caps, and other clothing. The pelt, winter,



Classing rabbit skins at Younghusband's, Kensington.



A bin of classed rabbit skins ready for auction.

in this manner turn yellow in colour and must be sold as "dip-stained" with a loss of approximately 12d. to 18d. per pound.

Skins should not be kept too long, but put on the market as soon as possible. Old skins become stained and stale looking, and may be classed as damaged. Furthermore, buyers prefer fresh skins, caught during the current season. The demand for winter skins is greatest during June, July,

incoming, autumn, and occasionally rack skins are usually purchased by furriers for the manufacture of fur (coney) coats and other fur garments.

About 70 per cent. of rabbit skins are at present being purchased by United States buyers, and this is providing Australia with valuable dollar credits. It will be appreciated, therefore, that the rabbit, although regarded generally as vermin, has his virtues, inasmuch as he provides one of the most valuable exports from Australia to the United States of America, and the carcass is providing thousands of people in the United Kingdom with nourishing food. Last year 4,528,137 pairs of carcasses were exported to England.

The gross value of rabbit and hare skins produced in Victoria during the six years

has averaged more than two million pounds. The weight and value of skins utilized during each of these years are shown in the table on this page.

It will be noted that, during 1946-47, the 4,947,452 lb. of skins exported were valued at £2,020,950, or 8s. 1½d. per lb. In other words, 2,208¼ tons valued at £915 per ton were exported. The skins used locally by hatters were valued at only 2s. 3¼d. per lb., and the skins used by local furriers were valued at nearly 15s. 6d. per lb.

This year, 1947-48, the demand from America has eased slightly and skins have

for fox skins and 700s. per dozen for 52 o'possum skins were paid. On the 3rd July the record price of 238½d. per pound for 197 lb. of rabbit skins and up to 53s. 3d. per dozen for hare skins were paid. At the present time 78d. to 80d. per pound for racks which constitute the largest proportion of good rabbit skins and up to 18s. per dozen for good hare skins are being paid.

All rabbit skins sold at auction, and/or exported, are under the control of the Australian Rabbit-Skin Board which may impose a levy up to 1s. 6d. per pound at any time to subsidize the purchase of skins by local hatters.

RABBIT FLESH

In addition to their fur-bearing qualities, rabbits provide a good, white, wholesome meat for human consumption, and even when the price of a fresh large rabbit is as high as 1s. 6d., the meat is as cheap as any offering.



Rabbits at an abattoirs being transferred to the skinning and grading sheds.

been a little cheaper than last year and the previous year when record prices were obtained.

Record prices for furred skins were obtained at auction sales held on the 26th June and 3rd July, 1946. On the 26th June the record prices of 532s. per dozen



Dressed rabbits being graded and packed for export.

WEIGHT AND GROSS VALUE OF RABBIT AND HARE SKINS SOLD IN VICTORIA, 1941-47.

	1941-42.	1942-43.	1943-44.	1944-45.	1945-46.	1946-47.
Skins exported (including hares)—						
Weight lb.	4,274,365	3,234,179	5,906,243	5,750,112	6,203,553	4,947,452
Cash value	£1,648,356	£988,346	£2,072,741	£1,750,681	£2,616,670	£2,020,950
Skins used by hatters—						
Weight lb.	886,493	822,591	776,097	744,315	567,814	559,810
Cash value	£97,810	£94,105	£83,673	£77,957	£58,692	£63,924
Skins used by furriers—						
Weight lb.	117,044	139,216	211,710	124,306	21,750	50,098
Cash value	£63,393	£95,254	£161,230	£94,358	£18,256	£38,659
Total—						
Weight lb.	5,277,902	4,195,986	6,894,050	6,648,733	6,793,117	5,573,362
Cash value	£1,809,559	£1,177,705	£2,317,644	£1,922,996	£2,693,618	£2,123,533

The retail price of skinned rabbits has been fixed by the Prices Commission at 9½d. per pound and with meat rationing and the shortage of meat coupons the consumption of rabbits locally has increased greatly in recent years. No figures are available for the quantity of rabbits used for human consumption in Victoria.

The export of rabbit carcasses, mostly to the United Kingdom, amounted to over 4½ million pairs valued at over half a million pounds (£500,000) last year. This

huge quantity would supply thousands of people overseas with much needed food.

The quantity and value of rabbit carcasses exported from Victoria during the past six years are as detailed hereunder.

Since January this year thousands of pairs of rabbits have been exported to the United Kingdom in the fur.

Carcasses not required for human consumption make a splendid substitute for skim milk or meat meal in the rations of pigs and poultry.

RABBITS EXPORTED FROM VICTORIA, 1941-47.

—		1941-42.	1942-43.	1943-44.	1944-45.	1945-46.	1946-47.
Carcasses (pairs)	Number	58,144	95,793	328,487	1,379,537	1,035,311	4,528,137
	Cash value	£4,334	£10,283	£28,520	£160,675	£109,044	£528,825

AVIAN TUBERCULOSIS

Poultry, or indeed any birds, are susceptible to tuberculosis. Birds contract their own special form of tuberculosis, caused by bacteria which are clearly separable from the bovine and human forms of tubercle bacillus. Avian tuberculosis is not nearly so dangerous to humans as the bovine and human forms of the disease, but is readily transmissible to pigs, either through their contact with poultry or feeding poultry products to them.

Avian tuberculosis is characterized by symptoms of chronic debility, or "wasting" and lameness. The number of cases tends to vary with the age of the birds, but sometimes pullets under laying age are affected. On post mortem examination, yellowish tubercles of varying size are found in the liver spleen and intestinal wall, and in the bones of the legs. To ensure diagnosis, affected birds should be sent by rail to the Director, Veterinary Research Institute, Parkville, care Spencer-street Railway Station.

Though seldom seen on commercial poultry farms, avian tuberculosis is a potential menace to the industry, and a great source

of loss to the "back-yard" poultry farmer. This is because birds are retained for a longer period here than on commercial farms, and also because poultry runs and fowl houses on mixed farms are often allowed to become highly contaminated through many years of accumulated droppings.

The chief route of infection is through the digestive system, and the droppings become heavily infected with the causal organisms. These bacteria are different from the other forms of tubercle bacilli in that they are resistant to sunlight, and may lie dormant for a long period before being eaten by poultry. Control of avian tuberculosis presents many difficulties, and unless the birds have been running on a concrete floor, it is necessary to shift all houses and runs on to clean ground. Contacts must be disposed of, and a fresh start made. The most serious cases occur where a large flock has been developed on inadequate premises.

[Contributed by the Live Stock Division.]

CEREAL TESTS

IN THE

NORTHERN DISTRICTS

The following account of cereal experimental work conducted at Dookie Agricultural College and other Northern District centres, was prepared by Mr. H. C. H. Watson, B.Agr.Sc., Dip.Agr. (Dookie), Field Officer. This article, together with other material published in the March issue of the Journal, has been included in a guide book which is available for general distribution and for the information of visitors to the College.

HAY TRIALS

Wheat and Oats Varieties

Hay experiments with wheat and oats have been carried out on fallow and stubble land since 1934-35. In the tests on fallow, Turvey and Warden were the most prolific of the hay varieties tested over the full period. (See Table 2).

Warden, on account of its red grain, is suitable as a hay wheat only, and not as a dual-purpose variety. In addition, other hay wheats, including Yandilla King, Yaward, and Wardfir, were tested from time to time. Of the newer varieties, Ben-cubbin was the most promising dual-purpose wheat when the tests were discontinued in 1941.

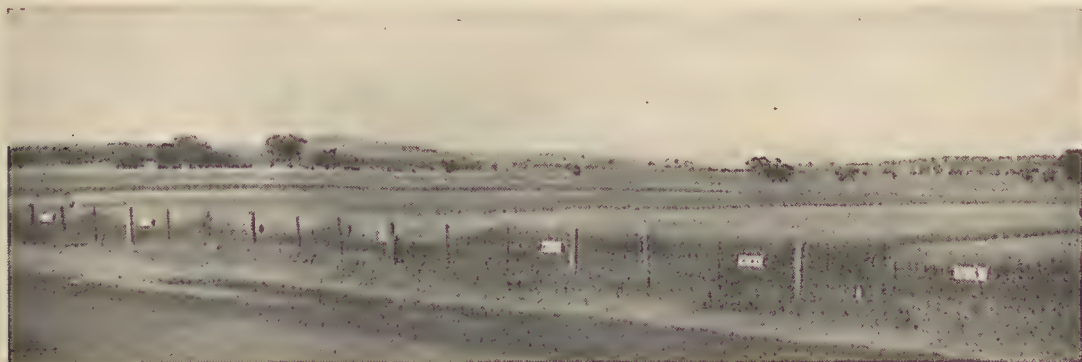
Very little wheat is sown in Victoria specifically for hay production, oats being preferred as a rotation crop, and recommended for this purpose. However, considerable areas of wheat are cut for hay annually from the wheat paddocks, mainly the "tracks" around fences and between

blocks of crop left for stripping. Ben-cubbin is considered to be suitable dual-purpose wheat for all Northern Districts while Magnet is recommended for the North-Eastern districts.

The oat varieties, Algeribee and Dawn, were also tested on fallow land, both giving higher average hay yields than the wheat varieties over a three-year period.

TABLE 2.—HAY VARIETY TRIALS ON FALLOW WHEAT AND OATS.

Variety.	Hay Yields in cwt./ac.		Grain Yields in bus./ac.
	Average 3 Years, 1939-41.	Average 7 Years, 1935-41.	Average 2 Years, 1940-41.
<i>Wheat—</i>			
Ben-cubbin ..	55.0	..	44.8
Dundee ..	55.2	..	42.2
Warden ..	55.2	52.0	41.4
Turvey ..	55.5	52.6	40.1
Baldmin ..	50.1	..	47.0
Magnet ..	44.7	..	46.8
<i>Oats—</i>			
Algeribee ..	60.9	..	53.4
Dawn ..	55.6	..	39.0



Seed production plots at Dookie.

In the oaten-hay trials on stubble land, several new varieties were introduced to compare their hay yields with older types. The average results until 1943, when the trial had to be abandoned, are summarized in Table 3.

TABLE 3.—HAY TRIALS WITH OAT VARIETIES—ON STUBBLE.

Yields in cwt./ac.

Variety.	Average 4 Years, 1937-38, 1942-43.	Average 2 Years, 1942-43.
Algeribee	22.2	24.2
Dawn	21.6	22.4
Algerian	20.4	21.8
Palestine x Dawn 5103 ..	20.0	19.0
Belar	19.0	19.4
Mulga	18.6	18.5
Gidgee	18.5	17.6
Orient	..	17.4
Fulghum	..	19.5
N.Z. Cape	..	22.3

Over the four-year period **Algeribee** returned the highest hay yield. This variety is an improved selection of **Algerian**, and, like the parent variety, is a useful oat for general purposes—grain, hay, and grazing. It bears a general resemblance to **Algerian** but comes away more rapidly in early spring. In many tests throughout the State, **Algeribee** has shown higher-yielding ability for both hay and grain than **Algerian**.

Dawn, which is another variety of interest, is a mid-season oat which matures a week or so earlier than **Algerian**. It has given very good hay yields in most districts, and has proved a suitable variety for grazing purposes. Generally, **Dawn** gives a lower grain yield than **Algerian**. It shows to advantage in dry seasons.

OAT GRAZING TRIALS

The practice of sowing oats to provide feed for sheep during the winter and spring months has increased in recent years. An experiment to furnish information as to the best varieties for this purpose was commenced at Dookie in 1938, and results for three years are available. The test was designed to measure the amount of grazing obtainable from various oat varieties grown on stubble land and their recovery capacity



Heads of Algeribee.

after grazing. Since the rate of seeding has an important effect on the amount of feed produced, this feature also was incorporated in the trials.

The experiment was conducted in three sections, each receiving different grazing treatment, viz. :—

- (a) Completely fed off—not harvested ;
- (b) Grazed once and subsequently cut for hay ;
- (c) Not grazed—cut for hay.

Three varieties, **Algeribee**, **Dawn**, and **Mulga**, were sown in each section at two rates of seeding, 60 lb. and 90 lb. per acre respectively, and a uniform application of superphosphate, $\frac{1}{2}$ cwt. per acre, was used throughout the test.

The oats in sections “a” and “b” were grazed each year in August, and section “a” was subsequently completely fed off with two additional grazings in September and November. The amount of green feed available for the sheep was measured by clipping representative samples of the forage just prior to each grazing.

The results of the experiment, showing the quantities of green fodder and hay yields from each variety, and the produce obtained with the different rates of seeding, are summarized in Table 4.



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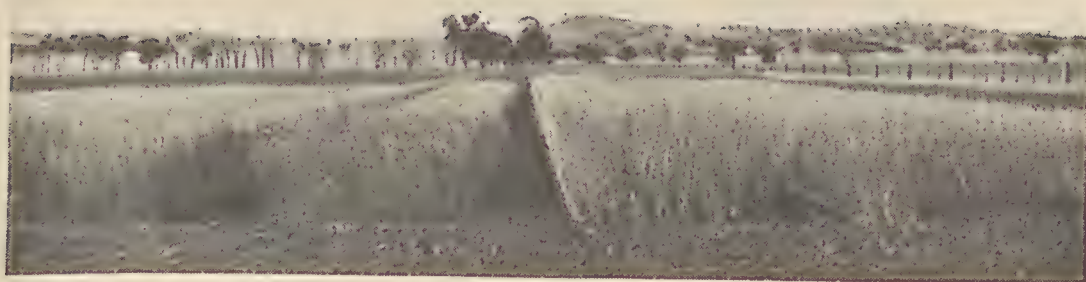
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Oat variety plots.

TABLE 4.—GRAZING TRIALS WITH OAT VARIETIES.—AMOUNT OF GREEN FEED PRODUCED AND RECOVERY CAPACITY AFTER GRAZING.

Average Yields—Three Years, 1938 and 1940-41.

—				Green Feed cwt./ac.	Hay Yield cwt./ac.
<i>Completely fed off—</i>					
Algeribee ..	..	..	..	54.7	..
Dawn ..	..	..	..	48.8	..
Mulga ..	..	..	..	42.9	..
<i>Grazed once—</i>					
Algeribee ..	..	..	..	10.9	23.1
Dawn ..	..	..	..	8.7	19.3
Mulga ..	..	..	..	10.2	17.1
<i>Ungrazed—</i>					
Algeribee ..	..	..	..	..	26.4
Dawn ..	..	..	..	..	24.6
Mulga ..	..	..	..	..	21.7

NOTE.—The yields are the average of both rates of seeding.

It may be noted that, in the "completely fed off" section, the later-maturing variety, Algeribee, gave the heaviest bulk, 54.7 cwt./ac., and the early oat, Mulga, the lightest quantity, 42.9 cwt./ac.

In the section "grazed once", Algeribee again produced most green feed, 10.9 cwt., and recovered best to register the highest hay yield, 23.1 cwt.

A feature of the experiment was that the oats receiving the one grazing in August did not recover well enough to return the quantity of hay produced on the ungrazed plots. An examination of the yields obtained in individual years, and the incidence of the rainfall, shows the importance of the spring rains in determining the recovery after grazing. If good late rains are received, the later-maturing varieties recover much better than the early types, but, in the absence of such rains, the yield reductions as a result of feeding off are just as great in the late as in the early varieties.

A factor of importance in determining the recovery of oats after grazing is the habit of growth of the plant. There are two distinct phases in the growth of cereal plants, the grassy or rosette stage, and the upright or reproductive stage. Grazing a crop in the grassy stage does not affect the main stools, but this grazing should be discontinued when the plant begins upright or stemmy growth. It has been found that even among varieties that ripen at the same time, there are big differences in the length of the grassy stage. In extensive oat-grazing trials carried out at the Mallee Research Station, Walpeup, it has been observed that Fulghum and Dawn, if ungrazed, ripen at approximately the same time, but Fulghum commences upright growth nearly a fortnight later than Dawn, and the grain yield of Fulghum is less affected by grazing than that of Dawn. A similar comparison can be made between Mulga and Orient as this oat also has a long grassy stage and a short post-jointing stage.

When an oat crop is being sown for the purpose of grazing to stock, much more feed is obtained if heavy rates of seeding are adopted.

The results with the different rates of seeding were as set out in the table hereunder. The yields are in cwt./ac., and are the average for the three varieties:—

—			Seed per Acre.	Green Feed.	Hay Yield.
Completely fed off ..			lb. 90 60	51·6 44·9	.. ..
Grazed once			90 60	9·9 9·6	19·5 18·7
Ungrazed			90 60	.. ..	24·4 22·6

In general, higher yields of both green fodder and hay were given with the heavier seeding rate, 90 lb./ac. This indicates that when oats are grown with the object of feeding-off, a fairly heavy amount of seed should be used, and, if the season is so favorable that grazing of the crop is unnecessary, no loss, and probably a gain, would result from the heavier sowing.

The oat-grazing experiments are being resumed at Dookie, and additional varieties now being tested include Fulghum, Algerian, and Orient.

WHEAT GRAZING TRIALS

This experiment was commenced in 1936 to determine the effect on yield of grazing the wheat crop with sheep in late winter and to compare the behaviour of different varieties under grazed and ungrazed conditions.

In the first year of the test, excessively wet conditions made it impracticable to feed off during the winter. The plots were eventually grazed in early September, although the crop by then had advanced far beyond the correct grazing stage. As would be expected, a marked reduction in yield, averaging 10 bus./ac., resulted.

Seasonal conditions in the next four years were suitable for the feeding off to be undertaken at the normal period, and the average results are shown in Table 5.

TABLE 5.—WHEAT GRAZING TRIALS.

Yields in bus./ac.

Average four years 1937–40.

—		Baldmin.	Ranee 4H.	Ghurka.
Ungrazed ..		32·0	28·6	30·7
Grazed ..		29·9	25·8	26·7
Decrease due to grazing ..		2·1	2·8	4·0

Seed 75 lb., super. 1 cwt./ac.

With each variety under test, the grain yield was reduced by grazing, the decrease, on the average, being greatest with Ghurka, namely, 4·0 bus./ac.

WHEAT MANURIAL TRIALS

In the nine years, 1927 to 1935, the wheat manurial trials on fallow at Dookie were conducted on two permanent sites cropped under the two-course rotation, fallow–wheat. In 1936, the trials were converted into a replicated test (under the randomized block system), and transferred to the present experimental fields which are sown under the three-course rotation, fallow–wheat–oats and



Sheep on experimental grazing plots.

peas. The quantities of the various manures applied, together with the average yields, are set out in Table 6.

TABLE 6.—WHEAT MANURIAL TRIALS—DOOKIE.

Wheat Yields in bus./ac.

Manurial Treatment per Acre.	Average 9 Years, 1927-35.	Average 11 Years, 1936-46.
No manure	18.0	21.9
Super. $\frac{1}{2}$ cwt.	22.0	27.7
Super. 1 cwt.	23.5	29.6
Super. $1\frac{1}{2}$ cwt.	24.6	30.6
Super. 2 cwt.	23.7	31.1
Super. 1 cwt. + lime 10 cwt. ..	27.3	..
Super. 1 cwt. + lime 20 cwt. ..	..	31.8
*Super. 1 cwt. + gypsum 10 cwt.	26.6	..
*Super. 1 cwt. + potash $\frac{1}{2}$ cwt.	23.9	..
*Super. 1 cwt. + potash $\frac{1}{2}$ cwt. + nitrate of soda $\frac{1}{2}$ cwt. ..	23.3	..
*Super. 1 cwt. + farmyard manure 10 cwt.	22.6	..

* These four treatments were excluded from the replicated tests as conducted from 1936. In 1939, two additional treatments were included, basic phosphate 132 lb./ac. and super. + gypsum 20 cwt./ac.

In these experiments, plots treated with superphosphate have given substantial increases in yield over the no-manure plots. On the other hand, no yield response was obtained with potash, nitrate of soda, or farmyard manure. Applications of lime and gypsum, applied one month prior to seeding, gave increased yields, but the extra returns were not sufficiently high to suggest that these materials could be economically used on the wheat soils in this district.

A guide as to the quantity of superphosphate to apply in general practice is given in Table 8, in which the results of the replicated tests are analysed in detail. The table shows the extra yields obtained with the various dressings, and the net monetary return from each application, with wheat valued at 4s. 3d. per bushel and superphosphate (22 per cent. basis) at £6 8s. per ton on the farm. It will be noted that, at the prices stated, comparatively heavy dressings of superphosphate have been profitable on the Dookie experimental sites.

Wheat manurial trials on fallow have been conducted at several other centres in the Northern Districts on various soil types, and the average yields are listed in Table 7.

Material increases from superphosphate were recorded in all cases, and the results, which confirm those at Dookie, demonstrate that the liberal use of this fertilizer is essential for efficient wheat production.

TABLE 7.—WHEAT MANURIAL TRIALS AT VARIOUS OTHER CENTRES IN THE NORTHERN DISTRICTS.

Yields in bus./ac.

	No Manure.	Super., $\frac{1}{2}$ cwt.	Super., 1 cwt.	Super., $1\frac{1}{2}$ cwt.	Super., 2 cwt.
INVERGORDON (av. 8 yrs. 1934-41).					
Yield	22.2	27.4	29.0	30.2	30.5
Increase	..	5.2	6.8	8.0	8.3
DIGGORA (av. 5 yrs.)					
Yield	11.0	15.1	16.8	17.3	..
Increase	..	4.1	5.8	6.3	..
WAARIA (av. 8 yrs. 1926-33).					
Yield	12.1	15.0	16.6	17.5	18.0
Increase	..	2.9	4.5	5.4	5.9
SHEPPARTON (av. 6 yrs. 1928-33).					
Yield	11.7	14.3	15.2	15.3	17.2
Increase	..	2.6	3.5	3.6	5.5

An examination of the returns in all the tests indicates that 1 cwt. per acre of superphosphate could be regarded as the standard dressing for wheat grown on fallowed land in the Northern areas, and, in some instances, the application could, with profit, be increased to $1\frac{1}{2}$ cwt. per acre.

OAT MANURIAL TRIALS

On Stubble

In some of the higher rainfall districts, particularly south of the Divide, mixtures of superphosphate and sulphate of ammonia have produced substantial increases in stubble-sown cereal crops. An experiment to determine the effect of these manures on stubble-sown oats in the Dookie district was commenced at the College in 1934.

The average results over five years (*vide* Table 9) indicate that the small increase in hay yield obtained from the nitrogenous manure was not sufficient to warrant a recommendation for its general use on stubble-sown oats in this district. Sulphate of ammonia is still in short supply, and the cost is too high at present for use on cereal crops.

TABLE 8.—EXTRA RETURN PER ACRE DUE TO SUPERPHOSPHATE—DOOKIE.

Treatment.	Average Yield 11 Years.	Increase Due to Super.	Value of Increase at 4s. 3d. per Bushel.	Cost of Super. at £6 8s. per Ton (22 per cent. Basis).	Extra Return per Acre Due to the Super.
	bus./ac.	bus./ac.	s. d.	s. d.	s. d.
No manure	21.9	..	..	..	..
Super. $\frac{1}{2}$ cwt./ac.	27.7	5.8	24 8	3 3	21 5
Super. 1 cwt./ac.	29.6	7.7	32 9	6 5	26 4
Super. $1\frac{1}{2}$ cwt./ac.	30.6	8.7	37 0	9 7	27 5
Super. 2 cwt./ac.	31.1	9.2	39 1	12 10	26 3

TABLE 9.—OAT MANURIAL TRIALS—ON
STUBBLE.

Manure Applied per Acre.	Average Yield 5 Years, 1934-38.
	cwt./ac.
No manure	23.7
Super. $\frac{1}{2}$ cwt.	25.7
Super. and ammonia (1-1), $\frac{3}{4}$ cwt.	28.6
Super. and ammonia (1-1), 1 cwt.	28.9
Super. and ammonia (2-1), $\frac{3}{4}$ cwt.	28.2

TABLE 10.—MINERAL DEFICIENCY TRIALS.

Treatment per Acre.	Wheat Average 2 Years, 1938-40, bus./ac.	Oats (Hay) 1940, cwt./ac.
Super. 1 cwt.	29.7	44.6
*Zinc sulphate 10 lb.	30.8	44.0
*Copper sulphate 10 lb.	27.2	43.6
*Iron sulphate 56 lb.	29.0	41.1
*Borax 5 lb.	29.5	44.9
*Magnesium sulphate 56 lb.	30.6	44.2
*Manganese sulphate 30 lb.	29.9	45.6
*Potassium sulphate 1 cwt.	31.0	42.1

* Each mineral was applied with 1 cwt. of super. per acre.

MINERAL DEFICIENCY TRIALS

Wheat and Oats

In addition to the minerals such as phosphate, nitrate, potash, and calcium, which are recognized as being essential for plant growth, it has been established that certain "trace" or minor elements, so called because they are required in minute quantities only, are also necessary for optimum plant development. Six of these "trace" elements or minerals (copper, zinc, iron, boron, magnesium, and manganese) were tested on wheat and oats at Dookie. Each mineral was applied with a basal dressing of 1 cwt. of superphosphate per acre.

In two years' tests at this centre, none of the minor elements produced any significant increase in the crop yields. There was evidence, however, that certain of these minerals had a detrimental effect on the crop



Main experimental field, September, 1947.

and, until more definite information is available, care should be exercised in their use on farm areas.

In view of the interesting results with zinc sulphate on black soils in the Wimmera, this material was tested on a similar type of black ground in the Dookie district. The plots were located on Mr. C. Bennett's farm for two years but no response from the zinc was obtained.

RATE AND TIME OF SEEDING TRIALS WITH WHEAT

In the rate and time of seeding trials, the wheat was sown at 50, 75, and 100 lb. of seed per acre. Three varieties, Ghurka, Baldmin, and Dundee were used in the experiment, each being sown at the three seeding rates, at two times of sowing—normal and late. The normal-sown section was drilled in early May, when practicable, and the late section approximately one month later.

The average results for three years are summarized in Table 11.

In regard to time of sowing, it will be noted that a substantial increase in the wheat yield was obtained in favour of the earlier sowing. This applied with each rate of seeding, the average increase in the plots being 5·8 bushels per acre.

TABLE 11.—RATE AND TIME OF SEEDING TRIALS—WHEAT.

Rate of Seed per Acre.	Average Yield 3 Years, 1938-40. Bushels per Acre.		
	Normal Sown (May).	Late Sown (June).	Difference in Favour of Early Sowing.
50 lb. ..	27·6	20·8	6·8
75 lb. ..	27·8	22·7	5·1
100 lb. ..	28·2	22·8	5·4
Average ..	27·9	22·1	5·8

The results confirm the general experience on the red loamy soils in the Dookie district, namely, that provided the fallow is in good order and the land reasonably free from weeds, the sowing of the wheat crop in May returns higher average yields than later sowing.

In connexion with the rate of seeding, there was little difference in the yield from the three treatments 50, 75, and 100 lb. of seed per acre, in the section sown in May. This would indicate that, for general sowing at this period, heavy quantities of seed are not warranted—a suitable amount for normal, clean fallow would be from 60 to 70 lb. per acre for wheat sown for grain.

In the later-sown section, however, the heavier sowings gave relatively better results than the light seeding, suggesting that, as the time of sowing becomes later, the rate of seeding may be increased to a certain extent.

CULTIVATION TRIALS WITH WHEAT

A depth-of-sowing test with wheat was conducted for a period of three years. On the average, the yields from shallow and deep sowings have been approximately the same. Trials with different cultivation treatments of the fallow at sowing time have been undertaken also. The tests were on fallow that was relatively free from weeds, and deep disking about a fortnight before



Winter fallowing at Dookie.

seeding did not reduce the wheat yield, nor did a harrowing after sowing have any effect on the harvest returns over the three-year period.

DISEASE INVESTIGATIONS

Wheat and Oats

The work at Dookie has included tests with various dry pickling powders used in the control of ball smut of wheat and smut diseases of oats, and also miscellaneous investigations on other cereal diseases.

YIELD TRIALS were conducted for several years to measure the effects of various pickles on the yield of wheat and oats. The powders tested were copper carbonate and two of the mercurial compounds which have come into prominence in recent years as cereal fungicides. The grain used in these trials was apparently clean seed, and it was not artificially smutted. The cereals were dusted with the powders before sowing, and unpickled check plots were included. There was no significant difference in the yields from the pickled seed compared with the untreated grain, and it was evident, therefore, that the pickling powders did not stimulate increased yields with wheat and oats when normal clean seed was sown.

EFFECTIVENESS OF WHEAT PICKLING POWDERS.—Various brands and types of commercial pickling powders have been tested to compare their efficacy in controlling *ball smut of wheat*. In this series of plots the grain (Dollar wheat) was artificially infected with spores of the disease and dusted with each powder. The results showed there are differences in the effectiveness of the powders tested, and the better brands of mercurial compounds give the highest degree of control.

WHEAT PICKLING—GENERAL COMMENTS.—Experience has shown that farmers should always carefully pickle their seed wheat, otherwise losses in yield from ball smut may be serious. The sowing of wheat which has not been pickled is a risky and unwise practice.

For many years the dry method of pickling, using copper carbonate, has been recommended by the Department of Agriculture, in preference to the wet treatments—formalin and bluestone. An important point in dry pickling is that the mixing of the grain and powder should be very thoroughly done, so that each grain is thoroughly dusted. With copper carbonate, $1\frac{1}{2}$ oz. per bushel of wheat is the



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dressing advocated, and this quantity, if carefully mixed, should give satisfactory control.

Regarding the new mercurial compounds, Departmental tests have shown that the best brands of these powders are very efficient fungicides, and, when thoroughly mixed, 1 oz. per bushel of wheat is sufficient to use for complete control of ball smut. Although the mercury compounds are more poisonous than copper carbonate, it has been found in practice that, as a general rule, there is little danger in using them, as their dust does not rise so readily as the copper powders. For this reason grain treated with mercurial pickle is usually more pleasant to work with; also, grain so treated runs more freely through the combine or drill than seed pickled with copper powder. Further, the mercurial compounds are the most efficient pickles to use for the control of covered smut of barley and smut diseases in oats.

The mercurial powders, however, are more expensive than copper carbonate, but their advantages (as indicated above) somewhat offset the higher cost.

LOOSE SMUT OF WHEAT, also known as blow smut, is much more difficult to control than ball smut. As the grain becomes infected internally (and not externally as with ball smut), ordinary pickling methods are ineffective. Hot water treatment of the seed is one method used, but it is not easily applied on large quantities of grain.

The development of resistant varieties and other experiments on the control of this disease are being carried out by the Department of Agriculture at various centres. The work at Dookie has been confined to different cultural treatments on the growing crop.

The only practical step the farmer can take to minimize loose smut of wheat is to sow seed harvested from a crop known to be comparatively free from the disease. When an appreciable amount of this smut appears in the crop a change of seed is desirable.

OAT PICKLING TRIALS.—Experiments on the capacity of pickling powders in controlling head smut diseases of oats also have been carried out at Dookie. The tests were made with "infected" seed which was obtained from another district from oat crops exhibiting a heavy infection of smut in the previous year. Unpickled check

plots were included, and the efficacy of the powders was measured by making counts of the number of smutted heads which developed during the season. The figures were as follow:—

Oat Pickling Tests

	NUMBER OF SMUTTED HEADS.	
	1937.	1938.
Unpickled	1,046	1,615
Copper Carbonate	674	1,306
Mercurial Compound C ..	39	1,061
Mercurial Compound A ..	6	589

It will be noted that each pickle gave some degree of control, best results being obtained with the mercurial compounds. In both years of the test, the smut infection was relatively low, and in the unpickled plots was about 2 to 3 per cent.

In some seasons these oat diseases can be very severe, and infections of up to 35 per cent. of the total plants have been recorded. Various experiments have proved that the oat smuts can be definitely checked by pickling. In view of the common occurrence of these diseases, particularly in the moister areas, it is sound practice for farmers to regularly pickle their seed oats. The use of the mercurial powders is the most effective treatment and the dressing advocated for oats is 1½ to 2 oz. per bushel.

Experiments at other centres have shown that the mercurial compounds are very efficient also in controlling covered smut of barley.

SUSCEPTIBILITY OF WHEAT VARIETIES TO RUST.—The development of wheat varieties resistant to rust disease is one of the objectives of the Department's programme on wheat improvement. Investigations into the susceptibility to rust of the present-day varieties of wheat were previously carried out at Dookie. Observations and counts were made on a large number of wheats grown in a special enclosure under conditions designed to promote development of the disease. At present, the work is confined to field observations on the relative resistance of wheats in the variety trials. Such observations are not always consistent, but it has been demonstrated that the varieties Ghurka, Quadrat, Pinnacle, and Pindar show some degree of resistance to rust compared with the older varieties Federation, Free Gallipoli, and Rancee.

VARIETY TRIALS WITH BARLEY, PEAS, AND FLAX

In the barley trials at Dookie, four new varieties were compared with the standard types, Cape and Prior, in yielding capacity and malting quality. The results are shown herewith :—

TABLE 12.—BARLEY VARIETY TRIAL.
Yields in bus./ac.

Variety.	Average 3 Years, 1939-41.	Average 2 Years, 1940-41.
<i>Feed Types—6 rowed—</i>		
Cape	53.9	66.6
Sea of Azov x Roseworthy Oregon	46.4	54.4
Vaughn	46.2	58.4
Atlas	..	57.8
<i>Malting Types—2 rowed—</i>		
Research	47.6	59.4
Prior	41.3	53.0

Of the 6-row types, Cape returned the highest average yield, while the new malting variety, Research, which was bred by the Department of Agriculture from a cross between Prior and Plumage Archer, has given encouraging results.

The malting types, Research and Prior, produce grain of higher malting quality, and, therefore, higher value than do the feed types, such as Cape. The trial has been re-established this year, three varieties being under test.

Peas

For several years attention was given to the growing of field peas, a number of varieties being tested for grain yield. Results for two years only are available, viz.:—Dun, 35 bus. per acre; Lima, 31.8 bus. per acre; Collegian, 28.2 bus. per acre; Tasmanian Blue, 17.8 bus. per acre.

At present, investigations are being carried out in collaboration with the University School of Agriculture in regard to the factors determining the yielding ability of field peas. Accurate information concerning drought resistance, disease resistance, number of pods per plant, and number of seeds per pod, &c., is necessary to give a guide in the breeding and selecting of new pea varieties.

Previous experience with peas at Dookie has shown that inoculation of the seed with nitrogen-fixing bacteria prior to seeding does not materially increase growth and yield, thus indicating that the appropriate bacteria are present in the soils of the experimental areas.

Flax

Several varieties of flax have been grown from time to time, primarily to study their possibilities for linseed production. The climatic conditions of the wheat areas of the Northern District are not considered suitable for the growing of flax for fibre.

CROP ROTATION AND SOIL FERTILITY

ROTATION TRIALS

A series of crop rotation tests was commenced at Dookie in 1940. The experiment is designed to furnish information on the yield of wheat crops grown under various systems of rotation with oats, bare fallow, short-term pasture, &c., and to provide data on the important problem of maintaining soil fertility in comparable wheat-growing areas.

The rotations under test are as follow :—

1. Wheat—fallow;
2. Wheat—oats—fallow;
3. Wheat—oats grazed—fallow;
4. Wheat—oats grazed (ploughed spring);
5. Wheat—peas (grazed ripe)—wheat—fallow;
6. Wheat—oats + sub. clover—pasture—fallow.

In the four-course rotations, differences in wheat yields due to the effect of the rotation system are not apparent for several years, and such tests can only be conducted over an extended period. It is hoped that results will be available from this trial in the near future.

ESTABLISHMENT OF PASTURES ON CEREAL STUBBLE.—In all parts of the wheat belt pastures are of considerable importance, especially in the better rainfall sections where mixed farming is practised to a greater degree. In addition to the revenue provided from grazing, principally with sheep and lambs, land spelled in pasture is regenerated in soil fertility, which tends to deteriorate when intensive cropping is carried out over many years.

A common practice is to allow the paddocks that have been regularly cropped to revert to "grass" for varying periods. The carrying capacity of such volunteer growth is often of a moderate to low standard, and, where conditions permit, much better results are obtained by introducing various pasture species either under a cover crop or by surface sowing. In many districts considerable success has been obtained with subterranean clover, Wimmera rye grass, and often with lucerne introduced in this manner.

Experiments on the establishment of these short-term pastures on land normally cropped with cereals were initiated at Dookie in 1939.

Several pasture species have been sown both with and without a cover crop, and include subterranean clover (Mount Barker, Bacchus Marsh, and Dwalganup strains), burr and barrel medicks, bokhara and perennial red clovers, lucerne, Wimmera rye grass, *Phalaris tuberosa*, and *Bromus inermis*. To date, subterranean clover and Wimmera rye grass are the only two species that have been established successfully. It has been observed that, in some seasons, pasture plants develop better under a cover crop. Where no cover crop was sown, weeds made headway and adversely affected the less vigorous pasture species. Another advantage of a cover crop is that a cash return may be obtained in the first season of pasture establishment.

SOIL FERTILITY TRIALS—CLOVER-LEY FARMING.—Recent investigations at the Rutherglen Research Station (annual rainfall 22 inches) have demonstrated the possibilities in the wetter portions of the wheat belt of clover-ley farming, a system under which cereals may be successfully grown in rotation with clover pasture.

An application of this system consists of cultivating a clover paddock, growing at least two successive cereal crops, and then allowing the paddock to revert to pasture for a further period. Usually the clover will re-establish itself naturally in the stubble of the second crop, but, if the strike of clover is poor, then a third crop can be sown together with subterranean clover seed.

Under Rutherglen conditions, clover-ley farming without fallow has proved successful, and the yields are higher than

those obtained on fallowed land which has been regularly cropped with cereals. After a regular cropping paddock has been allowed to go out to clover pasture for a few years, the soil fertility is increased by the clover plant, which raises the level of soil nitrogen and improves the texture or workability of the land. Therefore, the inclusion of subterranean clover in rotation with cereal crops makes possible a system of farming in which the customary fallow may be omitted without loss of yield or reduction in soil fertility.

Among the advantages of this method of farming are that stock-carrying capacity could be increased, the cereals produced at lower cost, and the replacement of the fallow by the clover pasture would assist in reducing the amount of soil erosion. For the system to be successful it is important that the clover be well established before the regular rotation is commenced, and that the pasture be effectively topdressed and grazed.

A disadvantage of clover-ley farming, on the other hand, is that the whole of the soil cultivation is concentrated into a relatively short period in the autumn. The system, however, should be applicable to at least portion of the farm. Further, it is limited to those moderate rainfall districts where clover becomes readily established and cereal growing is undertaken.

The effect of subterranean clover in restoring soil fertility of well-cropped cereal paddocks, as illustrated at Rutherglen, is now being investigated at Dookie also.

Experimental plots have been commenced at the College to ascertain—

(a) deterioration of soil fertility when land which has been under subterranean clover for many years is intensively cropped with cereals;

(b) time of cultivation of clover-ley, and particularly whether the clover-ley system without fallow will succeed under Dookie conditions;

(c) rate of regeneration of soil fertility on regularly-cropped land after varying periods under the clover.

Changes in soil fertility will be measured by chemical analysis of the soil itself, and by the yield and quality of the wheat produced.

"PHALARIS" CULTIVATION TRIAL—

Phalaris tuberosa is a perennial species which will persist under an annual rainfall as low as 14 inches, although it is not usually recommended for such dry conditions. It is a slow starter and early autumn sowing is advisable to allow the plants to become well established before the winter-growing weeds develop. To obtain a balanced pasture a leguminous plant should be grown in association with the "Phalaris", and subterranean clover is the species most commonly used.

In some established pastures which have been lightly stocked, "Phalaris" tends to become concentrated into tussocks. A small area of this type of pasture is available at Dookie, and the opportunity has been taken of initiating a cultivation trial to determine whether these tussocks can be broken up by various implements and the plants dispersed more evenly over the pastures. The trial will also indicate whether "Phalaris" will survive cultivation and cropping to wheat. These plots were cultivated just prior to cropping.

FAT-LAMB RAISING TRIALS

In 1945, it was decided to conduct fat-lamb experiments at the College in order to amplify the work which had been carried

out at the Rutherglen Research Station for some years, and to ascertain the extent to which results obtained at Rutherglen are applicable at Dookie.

Flocks of Border Leicester x Merino ewes were mated with Southdown and Corriedale rams to compare the progeny as fat lambs. Records were kept of the number of lambs dropped in each group, their live weights, grade classes, average frozen weights, skin values, &c.

The season was favourable for fat-lamb production, and heavy lambs were marketed from both crosses, as follows:—

Ewe.	Sire.	Average Weight Lamb.	Value (on hooks).
		lb.	s. d.
Border Leicester x Merino	Southdown	41.1	35 0 $\frac{3}{4}$
Border Leicester x Merino	Corriedale	36.9	31 2 $\frac{1}{2}$

This season, the three breeds of rams most commonly used in the Northern Districts, viz.:—Border Leicesters, Southdowns, and Dorset Horns, were each mated with two types of ewe, viz.:—Border Leicester x Merino and Comeback. Careful records were again kept, and the lambs were slaughtered at the Shepparton Freezing Works as in the previous year.

THE FOOT LOUSE OF SHEEP

Two factors are responsible for an increase in the number of Victorian sheep suffering from attacks by the foot louse, namely unfamiliarity of many flock owners with this parasite, and the fact that ordinary dips containing arsenic are not effective against the parasite.

The foot louse is a small blue-grey insect, a little larger than the ordinary body louse of the sheep. It does not occur in the wool, being confined to the legs. It is rarely found above the knees and hocks and only very infrequently above the fetlocks. Probably the best way to discover the presence of this parasite is to turn the sheep up and move the thumb upwards through the hair, commencing from the hoof. If present, the lice usually form a ring around the leg just above the coronet. Sometimes they are found above the cleft between the hooves. Their blue-grey colour readily distinguishes them. Considerable irritation can be caused by the lice, and affected sheep give evidence of this by stamping the feet and biting their legs.

The parasite may be controlled by putting sheep through a foot bath (1 ft. deep) containing derris root or rotenone. Experiments are now being carried out to test the efficiency of DDT for control of this louse and to date results have proved encouraging although not 100 per cent effective. Further trials are being undertaken. Sheep owners should remember that the foot louse is scheduled under the Stock Diseases Act and it is an offence against that Act to expose infested sheep for sale.

[Contributed by the Live Stock Division.]

IN THE ORCHARD

By G. W. GAYFORD B.Agr.Sc. Senior Horticultural Instructor

AUTUMN SPRAYING FOR "SHOT HOLE"

APRICOT Scab or "Shot Hole" may be the cause of much blemished fruit in seasons which favour its development.

Following wet, humid conditions in the spring, the disease may become widespread unless proper precautions have been taken. The disease affects the fruit by causing purplish spots to appear which later become hard and scaly. The leaves are also affected, the infected sections dropping away, leaving small round holes—hence the name, "shot hole". The same disease may affect cherries, peaches, and almonds, causing the shot-hole effect in the leaves. In wet seasons the disease may cause severe gumming of developing almond fruits. The disease may also kill out buds of peaches and apricots.

Control

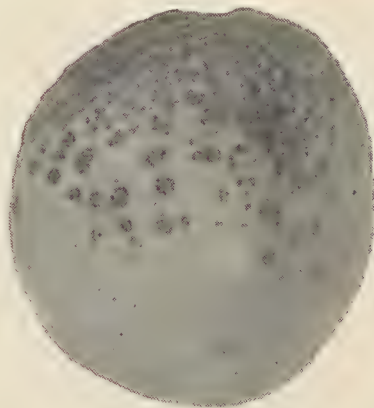
For control, a spray of Bordeaux mixture, 6 : 4 : 40, should be applied to stone fruit trees when the majority of the leaves have fallen, usually about the end of May, and again in the spring when the buds are showing pink tips. Home-made Bordeaux mixture, although the oldest copper fungicide in existence, is still the most efficient. Dry copper compounds, although much simpler to use, do not have the same high degree of dispersion when diluted in the spray mixture and are not as adhesive as Bordeaux.

For a spray vat of 100 gallons capacity, dissolve 15 lb. of bluestone in a non-metallic container (a wooden barrel, or oil drum painted on the inside with bituminous paint would be suitable).

The correct weight of bluestone may be placed in a muslin bag and suspended across the top of the barrel, when it will gradually dissolve. If desired, a concentrated bluestone solution may be made by dissolving 45 lb. of bluestone in 45 gallons of water and then 15 gallons of this solution will provide the correct quantity of bluestone for 100 gallons of spray. Water should be added to the spray vat

to bring the total quantity of diluted bluestone up to 92 gallons.

Mix the lime (15 lb. of slaked lime or 10 lb. of burnt lime) in 8 gallons of water and add this to the spray vat with the agitator in motion.



Apricot Scab ("Shot Hole")

BROWN ROT IN STONE FRUITS

The ravages of this disease have been felt throughout the fruitgrowing areas of the State during the past season. The first signs of the disease appeared in the form of blossom blight in the Goulburn Valley peaches. Then considerable losses occurred in the cherry crop, many cherry trees being so severely infected that it was impracticable to harvest the crop.

Infection also appeared during the season in dessert and canning peaches. Many growers have developed a complacent attitude towards brown rot and are content to dismiss it from their minds as one of those diseases which occur in wet, humid weather, and about which little can be done. However, this is far from the truth, and there is one most important control measure which, if carefully carried out at this time of the year, will reduce brown rot incidence.

Old infected fruits or "mummies", large quantities of which may be seen hanging in trees at the present time, are the main source of brown-rot spores in the following season. These "mummified" fruits should

be carefully collected and destroyed or buried deeply by ploughing. Cherry growers in particular should take note of this advice. It may appear to be a large-size job to remove the mummies from a cherry orchard but, on the other hand, it is disheartening to see such valuable crops lost as a result of this disease. Money spent in removal of the infected mummies this year will be repaid next season with a much healthier crop. In addition, the pink stage Bordeaux, 6 : 4 : 40, should be applied as a routine spray on all stone fruits.

"BUD-UNION DECLINE" DISEASE OF CITRUS TREES

A warning to intending citrus planters is given concerning the "bud-union decline" disease, which was first noticed in Victoria in 1941. This disease, which appears similar to "quick decline" in California, "tristeza" in South America, and "incompatibility" in South Africa, *is taking a heavy toll of orange and grapefruit trees growing on sour-orange or Seville rootstocks.* Until this trouble was noticed, the Seville stock was favoured because of high fruit quality and resistance to root and collar rots displayed by trees on this stock.

The name, "bud-union decline," has been given to this disease in Victoria because the vessels in the bark, which carry food material from the leaves to the roots,

become blocked at, and below, the bud union. This results in the starvation of the roots so that the whole tree is affected, the leaves turning yellow, and eventually the whole tree dies.

It has been shown that the disease may be spread from one tree to another by budding. It is also known that a tree may be carrying the disease without showing symptoms because the particular scion-stock combination is not susceptible. The rate of spread of the disease in Victoria indicates that some agent apart from budding is carrying the disease from one plant to another, but so far no such agent has been discovered. Scions of sweet orange, grapefruit, and mandarin, when grown on either sour orange or common lemon rootstocks, are susceptible to this disease.

The following advice is given concerning this disease. Do not order citrus trees which consist of susceptible scion-stock combinations. Eureka and Lisbon lemon trees should not be budded over to sweet orange, grapefruit, or mandarin. Where areas have already been planted with susceptible combinations, interplant with resistant combinations. A few growers may prefer to work over affected trees to lemons, which do not show the disease.

Trees on sweet orange and rough lemon are not susceptible to this disease, nor are lemons on any rootstock.

[D. M. McALPIN, B.Agr.Sc.]



"Mummified" fruits should be removed from trees at pruning time and destroyed. The specimens illustrated are cherries, peaches and plums.

THE VEGETABLE GARDEN

By GEORGE HYAM, Horticultural Supervisor

ALTHOUGH the choice of vegetables for May planting is small, those that are suitable will provide vegetables in late spring when the early spring crops have finished and the summer crops are not yet matured.

CABBAGES

East Ham cabbage seedlings can be planted in all districts, and, where obtainable, the Full-Irish East Ham strain is to be preferred. In the high cool districts, Savoy cabbages do well if planted out in May. In the south, the Parisian cabbage can be sown in the seed beds for July planting.

ONIONS

The seedlings of the early Flat White and Silverskin onions can still be planted out, but these should be transplanted early in the month. At the end of the month, seedlings of the Odourless and Brown and White Globe onions will be ready for planting out, though June and early July is still a good time to plant these mid-season kinds. In the north, May is a good time to sow the late onions for keeping. The Australian Brown and the White Imperial are the best of these.

LETTUCES

In all districts, a sowing of lettuce in seed beds for transplanting in July and August should be made in May. Where the rainfall is high and the soil heavy, it is better to sow in boxes of sandy soil to avoid "damping-off" disease and mildew. Suitable varieties for sowing are Imperial D. and Webb's Wonderful, and, in the north, New York can be sown in the seed-bed or where they are to be grown.

PEAS AND BROAD BEANS

Wm. Massey (Melbourne Market) peas can be sown in light coastal soils in the south and throughout the northern areas. Broad Beans can still be sown under similar

conditions, but in cold districts and on heavy soils in the south, further plantings of these are best deferred until July.



Savoy Cabbage.

ROOT CROPS

Artichokes are ready for use from May throughout the winter, but these should be lifted as required as they do not keep well out of the ground. Care should be taken to lift even the smallest tubers.

PEA-MITE

Late April and early May is the season when pea-mite makes its first appearance, and, if the controls are applied now, it is much easier to eradicate. The incidence of pea-mite varies from season to season, but there is some infestation every year in all but the high-rainfall districts. The pest is at its worst in dry autumns and winters.

The early broods usually start in grass and weeds and harbour under flat weeds such as capeweed. In any garden surrounded by grass paddocks, precautions should always be taken against invasion at this time of the year. Clean cultivation



Root divisions of two well-known culinary herbs.
Left—Thyme; Right—Sage.

round the beds is the first step, and if the vegetable plot is surrounded by a band of creosote, the insects will not cross this barrier. Trickle a line of crude creosote from the spout of a watering can, about 1 to 1½ inches wide, on bare soil. If the pea-mite is already attacking plants in the beds, dust with one of the special pea-mite dusts which contain nicotine, sulphur, and creosote. Contact insecticides are of little use, as the pea-mite harbours on leaves contacting the ground, under clods of earth or portions of plants out of the light.

CULINARY HERBS

May and June are good months to divide and replant clumps of culinary herbs. It is advisable to lift and divide herbs every

third year or so, choosing well-rooted pieces taken from the outside of the clump and rejecting the exhausted centre. Horseradish can be lifted for use now, and some of straight roots should be retained for replanting next month. Dig deeply with a fork and lift the whole root, as any small portion left in the ground will grow but will seldom form a usable root in the following year.

LIMING

On account of the relatively heavy watering, frequent cultivation and the nature of the crops grown, all vegetable plots should have an annual dressing of lime. This is best applied in late autumn and early winter.

With the exception of tomatoes and potatoes, all vegetable crops do best on a neutral or slightly acid soil. The best rate of dressing varies according to the nature of the soil. Soils showing high acidity require the most and usually the more organic manure applied in the previous season, the heavier the dressing.

For an average soil, the best form of lime to apply is the "agricultural" grade, or ground limestone, at the rate of about ½ lb. to the square yard. Dust the lime on the surface even in beds that are already planted, leave it exposed for a week or two, then rake it in. Do not dig it in deeply. Lack of lime causes the slow release of the natural plant food elements in the soil, but excess lime causes the too-rapid exhaustion of organic matter. Lime should be applied at least three weeks before any form of manure or fertilizer is applied.



APPROVED SEED POTATOES

List of Growers, 1948

By W. A. DOWNIE, B.Agr.Sc., Agricultural Research Officer

APPROVED seed potatoes are the produce of crops located in the main potato-growing districts which were planted with certified seed and which at flowering time showed no more than 7 per cent. of undesirable plants.

It is stressed, however, that approved seed should not be confused with

"Certified" seed. The latter, which conforms to a much higher standard of purity and freedom from disease, is only marketed in sealed bags carrying the official label of the Department of Agriculture. A list of growers of "Certified" seed potatoes appears elsewhere in this issue.

Name and Address of Grower.	Acreage.	Tonnage Ap- proved.	Name and Address of Grower.	Acreage.	Tonnage Ap- proved.
VARIETY—EARLY CARMAN.			VARIETY—UP-TO-DATE.		
Campbell, D. S., "Argyle," McKinnon's P.O., via Leongatha ..	1	4	Aflitto, J. G., McDevitt, via Colac ..	4	20
Coltery, John, Hesketh, via Woodend ..	2	4	Birrer Bros., Beech Forest, via Colac ..	1	5
Holt, F. J., Koonwarra ..	4½	18	Canaan Bros., Carlisle River, via Colac ..	16	80
Ingleton, R., "Blackwood Park," Narracan East ..	1½	5	Cartiere, B., Wyelangta, via Colac ..	7½	37
Jones, I. M., and Beecroft, Shellcott's-road, Korumburra ..	6	24	Cartiere, J., Wyelangta, via Colac ..	11½	57
Matthies, J. E., and Son, c/o Mrs. V. Nicholas, Ranceby, via Korumburra ..	2	8	Cashin Bros., Ferguson, via Colac ..	4½	22
Morton, Chas., McKinnon's P.O., via Leon- gatha ..	1½	6	Congram, W. J. P., Beech Forest, via Colac ..	9	45
Richards, L. H., Dumbalk, via Meenlyan ..	3	12	Finegan, P., Wyelangta, via Colac ..	11	55
Spring Bros., Romsey ..	9	18	Minchinton, E. F., and Son, Beech Forest, via Colac ..	18	90
Wilson, I. W., Neerim Junction ..	5	20	McCrickard, V., Websters Hill, via Colac ..	2	10
			Simmons, J. C., Wyelangta, via Colac ..	9	45
			Tibbits, J. M., Wyelangta, via Colac ..	3½	17
			Westbury, V. R., Wyelangta, via Colac ..	2½	2½
			Whelan, R. J., Wongarra, via Lorne ..		
VARIETY—LATE CARMAN.			VARIETY—KATAHDIN.		
Balharrie, A. S., Italian Hill, Daylesford ..	22	44	Beazley, H. G., Emerald ..	6½	26
Benson, W. A., McDevitt, via Colac ..	5	10	Duncan, D. R., Gembrook ..	17	68
Boustead, G. and L., Dean ..	20	40	Dyer, M. H., Gembrook ..	16	64
Courtney, M. E., Daylesford ..	16	32	Foran, H., Waubra ..	12	24
Dow Bros., Ferguson, via Colac ..	13	65	Foster, H. J., Neerim ..	3	12
Dow, R. and W., Ferguson, via Colac ..	6	30	Farr, N. E., Wimba, via Colac ..	3	15
Eastdown Bros., Kinglake Central, via Whittle- sea ..	27	108	Moran, H. B., Waubra ..	4	8
Blac, Jas., Romsey ..	8	16	Spring Bros., Romsey ..	2	4
Lawrey, L. K., Kinglake Central, via Whittle- sea ..	15	60			
Lee, K., Lavers Hill, via Colac ..	1½	7	VARIETY—SEBAGO.		
Meehan, B. P., Websters Hill, via Colac ..	12	24	Aflitto, J. G., McDevitt, via Colac ..	6	30
Mossop, E. M. and W., East-street, Daylesford ..	9	45	Albert, R., Beech Forest, via Colac ..	2	10
McCann, S. M., Ferguson, via Colac ..	14	56	Amey and Wisewould, Jindivick ..	6	24
Owen, F. J., and Sons, Pheasant Creek, via Whittlesea ..	4	20	Balharrie, A. S., Italian Hill, via Daylesford ..	15	30
Pearce, A. E., Websters Hill, via Colac ..	15	30	Baulch, S. G., Beech Forest, via Colac ..	2½	12
Pearce, G. A., Musk ..	4½	22	Benson, W. A., McDevitt, via Colac ..	6	30
Pearce, V. A., Websters Hill, via Colac ..	13	52	Berg, H. P., Trentham ..	7	14
Pretty, A., Kinglake Central, via Whittlesea ..	12	60	Beveridge, C. S., Glen-Aire-road, Lavers Hill ..	9	45
Skinner, F. T., Ferguson, via Colac ..	10	40	Birrer Bros., Beech Forest, via Colac ..	6	30
Smith, F. G., and H. J., The Patch ..	8	32	Boadle, L. H., Claretown ..	2	4
Thom, J. R., Kinglake, via Whittlesea ..	25½	102	Boustead, A. C., Dean ..	40	80
Toohy, D. J., Pheasant Creek, via Whittlesea ..	10	40	Box, M., Barramunga, via Colac ..	2	10
Toohy, J., Kinglake West, via Whittlesea ..	26½	106	Brown, C. D., Wyelangta, via Colac ..	6½	32
Toohy, L. F., Kinglake, via Whittlesea ..	7	14	Brown, D. B., Wyelangta, via Colac ..	10	50
Trowhella, Miss C. A., Trentham ..	3	15	Cashin Bros., Ferguson, via Colac ..	4½	22
Weston, C., Olengoloh East, via Colac ..	2	10	Cashin, E., Ferguson, via Colac ..	2½	12
Williams and Davis, Lorne ..	5	25	Coltery, Jas., Kerrie P.O., via Romsey ..	7	14
Winchcomb, W. D., Laver's Hill, via Colac ..			Congram, W. J. P., Beech Forest, via Colac ..	7	35
			Connelly, J. J., Koonwarra ..	2½	10

Name and Address of Grower.	Acreage.	Tonnage Ap- proved.	Name and Address of Grower.	Acreage.	Tonnage Ap- proved.
VARIETY—SEBAGO—continued.			VARIETY—SEBAGO—continued.		
Coulter, N. K., Nichols-road, Leongatha ..	4½	18	McMinn, H. G., Wyelangta, via Colac ..	4	20
Davies, W. R., "Brooksbank" Johanna River ..	4	20	McVeigh, H., Koonwarra ..	2½	10
Dean, C. C., Devondale, via Gellibrand ..	4	20	Parker, S., Ferguson, via Colac ..	5	25
Dyer, M. H., Gembrook ..	6	24	Pearce, V. A., Websters Hill, via Colac ..	2	10
Ebbels, J. T., Olinda ..	18	72	Pearson, H. and J., Dumbalk ..	14	56
Ewart, J. H. M., Hoddles Creek ..	2	8	Perry, J. A., Beech Forest, via Colac ..	7	35
Graham, D. J., Thorpdale ..	10	40	Pitman, L. H., Barramunga, via Colac ..	2	10
Grimwood, R., Lavers Hill, via Colac ..	1	5	Richards, L. H., Dumbalk, via Colac ..	1	4
Hemphill, N. G., Lancefield ..	3	6	Spring Bros., Romsey ..	5	10
Ingleton, R., "Blackwood Park," Narracan East ..	1½	5	Stacey and Vincent, Warrenheip ..	2	4
Lawrey, L. K., Kinglake Central, via Whittlesea ..	21½	84	Thom, J. R., Kinglake Central, via Whittlesea ..	2½	10
Lee, K., Lavers Hill, via Colac ..	6	30	Turvey, R. J., Bullarto South ..	7	14
Macklin Bros., Bullarook P.O. ..	19	38	Vagg, W. and E., Lavers Hill, via Colac ..	8	40
Monaco, V., and Son, Gellibrand, via Colac ..	2	10	Watson, A. C., Lavers Hill, via Colac ..	2½	12
Murchison, A. M. J., Ferguson, via Colac ..	8	40	Westbury, V. R., Wyelangta, via Colac ..	3½	17
McCann, S. M., Ferguson, via Colac ..	4	20	White, R. T., 13 Balf-street, Leongatha ..	1½	6
McCrickard, V., Websters Hill, via Colac ..	2	10	Wincomb, W. P., Lavers Hill, via Colac ..	8½	42
			Young, R. and A., Weeaprolnah, via Colac ..	2	10

Scabby Mouth in Sheep and Lambs

In cases of scabby mouth, ulcers form on the lips and nose and later develop into cysts or scabs. In severe cases, ulcers may be present on the membrane inside the mouth. The coronets and also the udders of ewes rearing affected lambs may be attacked.

The trouble is much more prevalent in lambs than in older sheep. The disease is due to a virus, and infection takes place through some slight injury caused by grazing on dry pastures or thistles.

Affected animals should be isolated immediately, as the condition is infectious.

In mild cases, wash the affected parts with 1 per cent. Lysol, monsol, or dettol (one tablespoonful to 2½ pints of water) and gently remove scabs. Then apply this ointment:—Monsol or dettol 5 parts, sulphur 10 parts, lard or vaseline 100 parts. Repeat the treatment three times a week.

In severe cases wash as before, then paint with tincture of iodine, and later dust with

a powder containing boric acid, two parts and chloride of lime, one part. Repeat as often as practicable.

The latest method of prevention and control is by means of vaccination. The vaccine is supplied by the Commonwealth Serum Laboratories, in the form of (a) dried powder in a sealed ampoule, and (b) diluting fluid in a stoppered bottle. Full directions as to its use are supplied with the virus. As the disease is communicable to man care should be taken not to get the virus in wounds as it may cause a skin infection which, though not serious, may be annoying. The best time to vaccinate is at marking time, but sheep of any age can be done.

Immunity develops in about two weeks and lasts for two to three years and possibly for life. If a flock already injected is vaccinated the outbreak subsides in a few weeks.

[Contributed by the Live Stock Division.]

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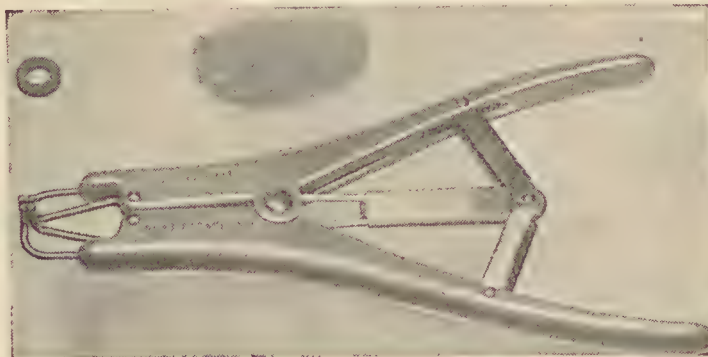
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WIND EROSION CONTROL

Comments on Methods Used in the Walpeup District

By H. J. Sims, M.Agr.Sc., B.Com., Cerealist.

ALTHOUGH the need for control of erosion on farming land is now fully realized by most Walpeup farmers, in the period immediately following settlement of the district, movement of sand from hills to the flats was not looked on with much concern. A light covering of sand over the flats greatly improved them. However, the difficulties in averting this movement when sufficient sand had been blown on to the flats were not realized at that time.

Discussion with original settlers indicates that erosion did not assume serious proportions until the 1929 drought, and since that time many farmers have altered their farming methods so as to reduce the movement of soil by wind. In 1935, the Walpeup Riding Fallow and Crop Association requested that points be allotted for drift control in fallow competitions, and that fallows be judged in the autumn to enable the judge to take into account the extent to which fallows were affected by wind during the summer period.

In his 1933 report on the local fallow and crop competition, H. L. Hore (then manager of the Mallee Research Station), commented that soil drift was a serious problem that year. He stated that the ploughing-in of stubble had reduced drift, and suggested that sandhills be ploughed wet and left in a fairly rough state. In the 1938 report (H. J. Sims), comment was made on the wind-blown patches on fallows, and it was pointed out that good results were obtained from the practice of ploughing-in straw. Two competitors that year were trying cover crops as a means of combating the trouble.

During the past ten years farmers have been modifying their cultivation methods to reduce the amount of soil drift, and information obtained from trials at the Mallee Research Station (established in 1932) has been the basis of many of these changes.

Soil erosion control measures were discussed at public meetings called by the Walpeup branch of the Victorian Wheat

and Wool Growers' Association in 1944 and 1945, and as a result the Department was requested to intensify experimental work concerning cultivation methods. It was also suggested that officers of the Research Station should inspect farmers' properties, record the erosion control measures being used, and comment on their efficiency. With the co-operation of Association members in this survey, the inspections were made between November, 1946, and June, 1947. A further result of these meetings was the establishment, by the Soil Conservation Board and the Mallee Research Station, of a ryecorn establishment area on Allotment 6A, Parish of Paignie.

SEASONAL CONDITIONS

During the first half of 1947, good rains were received in February and March, but April, May, and June were very dry. Winds were not severe in the early autumn, but in June, strong winds caused serious drift on late-sown areas. Rainfall data and wind records are given in Table 1. The seasonal conditions did not provide as severe a test as in many years; nevertheless, it was possible to make many useful observations and comparisons.

TABLE 1.—RAINFALL AND WIND DATA—
MALLEE RESEARCH STATION—WALPEUP.

Month.	Rainfall 1947.	Wind Run, Miles per Day.	
		1947.	1940-1946.
	Points		
January ..	4	225	228
February ..	210	196	220
March ..	197	193	207
April ..	35	163	183
May ..	28	154	174
June ..	97	210	174

NECESSITY FOR FALLOWING

On the farms inspected the fallowed areas were responsible for most of the soil drift. On grazing areas, and on less efficiently worked blocks the sandhills were the danger spots, and serious erosion has occurred on hills that have become bare of cover, and been allowed to remain bare.

The main objects in preparing a fallow are:—

(1) The preparation of a good seed bed for the crop in the following year.

(2) The conservation of moisture for the use of the crop sown in the next autumn.

(3) Control of weeds which is probably the chief factor in the conservation of moisture; their elimination also prevents them competing with the wheat crop in the following year.

(4) The liberation and storage of certain plant foods—soil nitrates.

(5) The control of certain diseases—take-all, root rots, and flag smut.

Experimental work and experience have demonstrated the superiority in the yield of crops grown on well-prepared fallows. Clean, bare fallows drift to a greater extent than dirty fallows; and blown patches on fallows cause progressive reductions in yields. These observations demonstrate the need for farming methods designed to minimize the amount of soil loss, but, at the same time, to prepare a fallow capable of giving a satisfactory yield.

Details of methods being used and tested in the Mallee are given in a booklet, "Soil Drift and Control Measures," by H. L. Hore, and in the current Guide Book of the Mallee Research Station. Copies of these booklets may be obtained on application to the Department of Agriculture, or the Mallee Research Station.

CONTROL METHODS USED

I. The Non-burning of Stubbles

This practice had been followed for at least fifteen years on some of the farms visited. General approval of the method was expressed, and it would be practised more generally if implements capable of doing a more satisfactory job of sowing oats in stubble and of working through stubbles were available.

Paddocks which grew wheat in the previous year were treated in one of the following ways:—

(a) Sown to oats, the oats to be cut for hay, harvested for grain, grazed, or grazed and harvested, depending on the needs of the farmer and seasonal conditions. Wheat sowing on stubble is seldom practised on these farms.

(b) Left out to grass.

(c) Fallowed.

In the past, when a paddock was sown to oats, it was usual to burn the wheaten stubble. This was particularly the case when oats were required for hay, and a clean crop was desired. If the stubble is not burnt, it is usually not possible to sow with the combine; therefore, other methods of sowing must be used.

The simplest method is to sow with a disc drill, but it is generally recognized this does not do a good enough job in most years.

Another method is to broadcast the seed with the drill and to cover the seed with the twin-disc (sundercut) or tandem-disc harrows. Refinements of this method are to mount the seed box on the twin-disc (sunderseeder) or to have the seed-box and tandem-disc harrows so hitched that both are pulled together. Although general satisfaction was expressed with these machines, some farmers considered the sun-derseeder rather heavy, particularly for sowing oats for feed.

Two farmers who were using the tandem-disc considered it better than the twin-disc. The tandem discs have proved more popular in the southern Mallee and Wimmera, where the ground is more level



Sowing oats with a drill and tandem disc-harrow combination.

and less stumpy. Owing to the shortage of new implements and other reasons, the combine was used to sow oats in some cases after the stubble had been burnt or fire-harrowed.

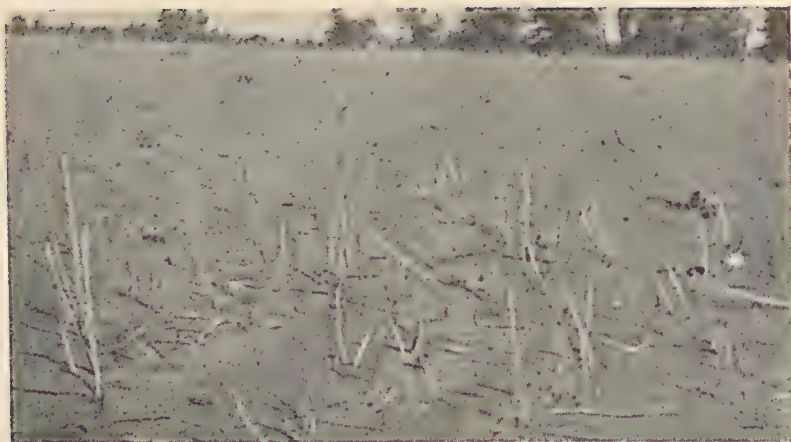
Where the stubble was left out to grass, no difficulties were met with in the subsequent working of the paddocks, as the straw broke down sufficiently by the time it was desired to work the ground again. On some farms a portion of the stubble ground was fallowed, and, in these cases, no stubble burning was practised, as the straw was dealt with adequately by the twin-disc.

The regular fallowing of stubble ground was not favoured, although the benefits of straw and other trash in lessening erosion was commented on. Rotations which enable the stubble to be utilized to prevent drift on fallows have been developed. One of these is fallow—wheat—fallow—wheat, followed by several years out to grazing.

Experiments conducted at the Mallee Research Station during the period 1939-42, while not giving spectacular results, demonstrated the value of straw in preventing soil drift when land is fallowed out of stubble.



Stubble land fallowed with a twin-disc plough.



Cover crop fallow at the end of summer. The grazed stubble has prevented the soil from drifting.

These experiments were suspended during the critical war years, but have now been resumed.

Some Canadian experiments on this matter have given interesting results. The effect of straw is to reduce the wind velocity at ground level and also to trap moving sand. It was shown that the wind velocity just above the soil surface was reduced from 16 miles per hour over a bare surface to 12 miles per hour over a similar soil that had half a ton per acre of wheat straw (stubble) worked into it. This straw reduced the amount of erosion by approximately 85 per cent. It was found that the more erodible a soil was, the greater the quantity of straw required for protection. The effectiveness of a given amount of straw also depends on the amount retained above the surface.

2. The Use of Cover Crops

The purpose of a cover crop on a fallow is to provide vegetative cover to protect the soil against erosion over the summer period. This involves the sowing of a cereal crop in the early spring on land fallowed and treated normally to that time. The crop is grazed down after the plants have become firmly established, and sufficient roots and stalks are left to protect the soil over the summer months. In Mallee Research Station guide books it has been emphasized that, for this method to be effective, the cover crop must be grazed judiciously, that is, sufficient cover must be left for the protection of the soil.

This growth should not be allowed to become excessive however as it reduces the amount of moisture stored in the fallow.

The impression gained from the inspections was that farmers found it difficult to properly control the grazing of the cover, as some cover crops had been grazed too heavily, while others had been allowed to make too much growth. Certainly the dry spring conditions made the management of cover

crops difficult, and these difficulties were increased by presence of young grass-hoppers. However, where the cover crop was not over grazed, its value in reducing drift was very obvious.

A slightly lower yield is anticipated on cover-crop areas, but those using this method were satisfied to have a slightly lower yield, as it meant the holding of their soil. They pointed out that a normal fallow that had drifted, had "hard patches" which also reduced the yield.

In order to obtain information concerning the effect of cover crop on the fallow, soil samples were taken at the Research Station in 1938 from normal fallow, cover-cropped, non-fallow, and stubble plots, at various depths to 3 feet. Moisture and nitrate-nitrogen determinations were made on these samples. The results of the analysis are shown in Table 2.

TABLE 2.—MOISTURE AND NITRATE-NITROGEN CONTENT OF CULTIVATION PLOTS AT MALLEE RESEARCH STATION 13TH MAY, 1938.

	Moisture Percentage.			Nitrate-Nitrogen (Parts per Million).		
	0 to 1 Foot.	1 to 2 Feet.	2 to 3 Feet.	0 to 1 Foot.	1 to 2 Feet.	2 to 3 Feet.
	%	%	%	p.p.m.	p.p.m.	p.p.m.
Normal Fallow	12.6	17.7	17.3	6.9	3.3	2.3
Cover Crop	10.8	16.2	16.1	6.8	2.6	2.9
Non-fallow	7.8	14.8	15.2	6.3	1.3	1.0
Stubble	5.6	12.9	12.7	1.8	1.0	1.8

It will thus be seen that the moisture content in the cover-cropped plots was a little lower than in the normal fallow, and the difference in nitrogen content was not great. An additional series of analyses made on the above samples indicated, however, that the mulch of the normal fallow contained a much higher amount of nitrate-nitrogen (11.3 p.p.m.) than did the cover crop (4.6 p.p.m.). This extra nitrogen at the surface should give the young plant a better start immediately after germination.

At the Research Station, the reduction in yield on the cover-cropped plots has not been great. Over a six-year test, during 1937-43, the average yield from normal fallow plots was 18.2 bushels per acre, compared with 16.9 bushels per acre from the cover-cropped plots.

In comparing the yields, some allowance should be made for the value of the feed obtained from the cover crop, but too much reliance should not be placed on this feed, as too much grazing defeats the purpose of the cover crop, namely, to hold the soil.

It is usual to sow the cover crop at the first working over of the fallow, normally in August. If weeds are present, the sowing may be delayed until the second working. The above procedure is used at the Research Station, and by those farmers using this method.

3. The Sowing of Ryecorn on Hills, Channels, and Other Vulnerable Points

Experience has shown that ryecorn is the most useful plant to stabilize any areas that have got out of hand. Mallee experience with ryecorn has been practically confined to the past twelve years. It was first tested at the Research Station in 1935, and, in that year, less than 100 acres were sown in the Mallee. Since 1942, its spread has been rapid, and the area now sown is approximately 7,000 acres.

Practically every farmer in the survey had had

some experience with this cereal, and outstanding results had been obtained on some properties. It is pointed out that rye should be sown early, so that the plant gets a good start before the ground becomes cold and slows up growth.

Where rye has been sown on the hills, it is usual practice to fallow up to the rye and to leave the rye straw for protection on the hills. One farmer pointed out that he got nothing off the hills when he fallowed them in the orthodox way, but he obtained quite fair grazing from the areas sown to rye. He found that rye straw would hold the hill for about three years, after which time daisies took possession.

The subsequent treatment of the hills is still being worked out, but one hill sown to rye in 1944 was successfully fallowed last year (the daisies helping to hold the soil) and was sown to wheat in 1947.

4. Adjusting Cultivation According to Soil Types

The workings given to the fallow by farmers adopting this practice are as follow:—

Bare hills are sown with a cereal (often rye) early in the winter. Apart from this sowing, the hills are not touched until after summer when they are ploughed or scarified after the first summer rains, and worked as necessary with the rest of the paddock if further autumn working is necessary.



Ryecorn sown on a light sandhill.



Fallows after the autumn working. Left: Cover-cropped.
Right: Bare fallow.

The flats are ploughed at the normal time (July–August) and cultivated as necessary during the spring.

5. Crop Rotation

Rotations on some farms had been disturbed by drought years, while on others they have not been stabilized since the changeover to tractor power. The following were the stated rotations of the farms:—

TWO COURSE.—Certain paddocks on three farms.

THREE COURSE.—Eight farms and certain paddocks on three farms partly worked on a two-course rotation. Of these eight farms, five were worked on a fallow—wheat—oats rotation while on

the other three, the rotation was set down as fallow—wheat—grass or oats for grazing.

FOUR COURSE.—Five farms. The usual four-course rotation was fallow, wheat, oats for hay or grain, and grass or oats for grazing. Those using oats for grazing in the fourth year did so because oats provided more feed, and limited the growth of barley grass, thus reducing its growth in the fallow in the subsequent year.

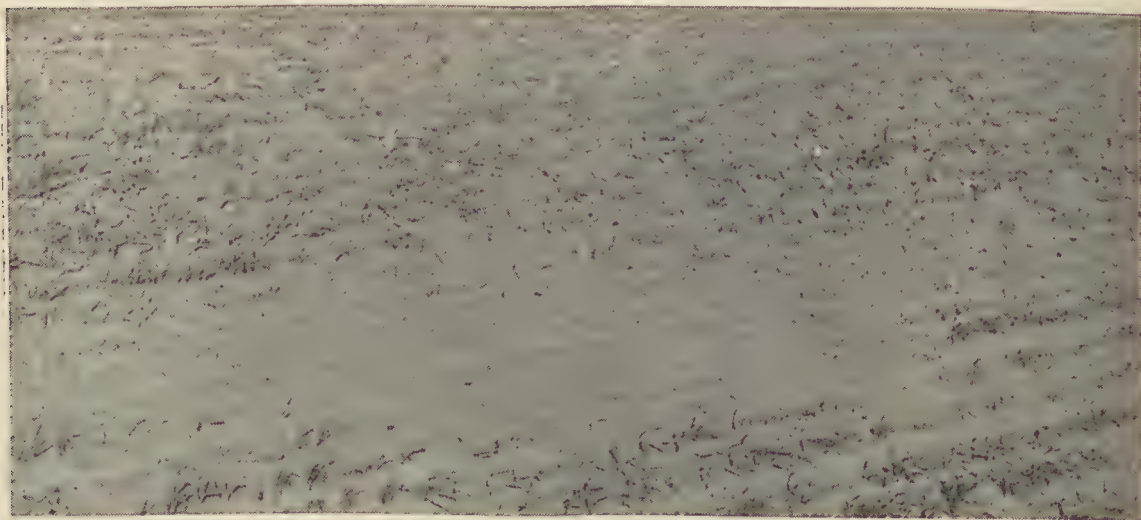
In general, longer rotations were considered advantageous, but the rotation adopted was determined largely by the size of the farm. Some stated they would like to be working on a longer rotation than they were using.

GENERAL COMMENTS

1. Implements

During the past ten years, there has been almost a complete changeover from horses to tractor power. Tractors were used on fourteen of the sixteen farms inspected. The many advantages of a tractor are realized, but two disadvantages were pointed out during the survey. These were:—

(1) The faster working pulverized the ground to a greater extent.



A "blown" patch in a young crop.



Grazing rotation plots at the Mallee Research Station.

(2) Hills too "heavy" for tractors were left unworked and unsown. Serious deterioration of hills on two properties was attributed to this cause, as unprotected areas became focal points for erosion, and, as the drifting areas spread, larger areas became difficult to work.

The twin-disc implement or sundercut was commonly used for fallowing. Only one farmer used the mould-board plough. The non-burning of stubble, and the working in of any rubbish present has caused this changeover. The farmer using the mould-board plough was working on a four-course rotation, and did not have much trash to handle.

Because of their better ability to handle trash, overhead draft scarifiers, and scarifiers with a better "stagger" of the points were favoured.

Several new types of machinery have been tested in various States, but the use of any special-purpose machine will be limited because of the extra capitalization it will add to the farm.

2. Stocking Policy

Several of the farmers stressed that they regarded too many sheep as having been the cause of erosion on their property. The assessing of carrying capacity is a

difficult matter. Similarly, a decision regarding the best action to take in a prolonged dry spell is not easy to make, as it is never known how much longer the spell will last.

The economics of hand-feeding during a drought are often questioned, but, if stability of stock numbers is desired, some hand-feeding will be necessary on occasions, even if a conservative stocking rate is adopted. Everyone is agreed on the evils of overstocking, but, in a drought, people are already in difficulties before they realize the full position, and then cannot "unload" stock without heavy financial loss.

One farmer considered grazing cattle more advantageous than sheep. They required less exacting fences, and did not graze as closely as sheep.

3. Leasing Policy

It was pointed out in several cases that leased blocks were in worse condition than adjacent blocks worked by the owner. It is generally agreed that short-term leases are not in the best interests of soil conservation. There is a tendency to overgraze leased blocks, and cultivation and cropping cannot be carried out to the best advantage because of the uncertainty of the renewal of the lease, and difficult areas such as

blowing hills, tend to be neglected. In this district, most of the leased blocks are held by private mortgagors, trustee companies, or banks.

4. Wild Turnip

This weed has introduced a further serious complication into Mallee farming. The weed is particularly objectionable at harvest time. It also causes much trouble by rolling on to fences. It has a large percentage of hard seeds, with the result that young plants come up after every rain. The only practical control of the weed seems to be additional cultivation, and this may not be wise always from the erosion control angle. It may delay also the sowing of sandy land to a date later

than is deemed desirable. This weed can be controlled by selective weedicides, but such control is too costly for general application.

PROPERTIES VISITED

Owners of the properties visited in the course of the survey are given hereunder:—

Messrs. A. W. Cheeseman, C. F. Corbett, Bell Bros., Gniel Bros., P. A. Hannig, E. J. Healy, W. H. Kruss, A. J. Latta, A. Lawrey, P. B. Leach, D. Leach, R. Mead, G. W. Pattinson, C. H. Towk, J. Vallance, and F. J. Wakefield. The co-operation and assistance of these farmers is acknowledged with appreciation.

Lucerne under Irrigation

Experiments in irrigated agriculture have been in progress at the State Research Farm, Werribee, for almost 30 years, and most of this work has had to do with the culture of permanent pastures and lucerne. The trials on lucerne showed that the factors necessary for success with this crop grown under irrigation were:—

(1) The layout for irrigation by flooding should be on the border system. Optimum size of bay depends on soil, slope, sidefall, &c. At Werribee, bays 10 chains long and half a chain wide gave good results.

(2) Grading within the bay should be as nearly perfect as possible and adequate drainage provided at the end of the bays.

(3) Thorough preparation of a clean, weed-free seed bed is necessary.

(4) 8 to 10 lb. per acre of good local lucerne seed of the Hunter River type is ample for seeding purposes.

(5) Shallow sowing is essential.

(6) Spring sowing is recommended for southern Victoria, autumn sowing in the north.

(7) Apply at least 1 bag of superphosphate per acre with the seed.

(8) Top dress each year with at least 1 bag of superphosphate per acre—the use of 4 cwt. superphosphate per acre was amply justified in fertilizer trials at Werribee.

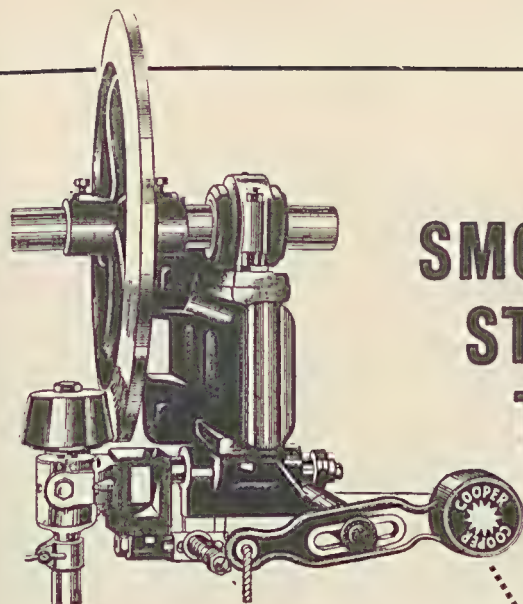
(9) Water adequately. Lucerne can stand longer between waterings than pasture, but, for best results, it has been shown that it needs as much water as pasture.

(10) Utilize lucerne by cutting for hay, silage, or green stuff, rather than by regularly grazing. Cut when in the early-blooming stage, and it is best to cut soon after a watering than before.

Under reasonable soil conditions and good treatment, a lucerne stand can be very profitable under irrigation for eight to ten years—up to 6½ tons of dried hay per acre were obtained at Werribee in favourable seasons from approximately five cuts.

[Contributed by the Pasture Branch.]

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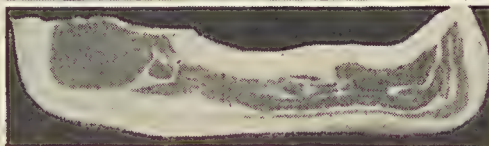
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BACON PIG CARCASS - - - COMPETITION

By. L. A. Downey, H.D.A., Pig Expert.



The winning pig, its side and loin cut. Large White, carcass weight 179 lb., exhibited by Mr. L. H. Castle, Bena.



THE Australian Meat Board's bacon pig carcass competition, held in Melbourne on the 12th to 14th May, 1948, demonstrated that, despite the difficulties experienced by the pig industry during the last few years, there is still sufficient enthusiasm among pig breeders and enough high-class breeding stock available to rejuvenate and expand the industry. It brought out the best exhibition of pig meat yet seen in Australia and created great interest.

The competition was the first of a series to be conducted, by the Australian Meat Board in each State of the Commonwealth. In conducting the competition, with which were associated a pig raisers' convention and sale of stud pigs sponsored by the Victorian branch of the Australian Pig Society, the Meat Board had the co-operation of the Victorian Department of Agriculture, the Royal Agricultural Society of Victoria, the Victorian branch of the Australian Pig Society, and representatives of the pig-meat traders.

The conditions of the competition required that each entry should comprise one pig of which the carcass weighed not less than 120 lb. and not more than 180 lb. Pure or cross-bred pigs were accepted provided their sire was of a pure breed. Each exhibitor was allowed to make two entries.

The pigs were first exhibited (but not judged) alive at the showgrounds of the Royal Agricultural Society, then slaughtered at the Imperial Freezing Works of William Angliss and Co., Footscray, where exhibitors and visitors had the opportunity of seeing the carcasses and attending a demonstration by Mr. J. Reynolds of the Meat Inspection Branch of the Department of Commerce and Agriculture on specimen pig carcasses and meat made available by Wm. Angliss and Co.

After chilling for a day the competing carcasses were returned to the Royal Agricultural Showgrounds where they were cut



The carcasses before cutting up.

and appraised by Mr. W. S. McAuliffe of the Department of Agriculture, South Australia. The sides and cut pieces of the carcasses were then displayed together with the measurements and points awarded for each feature of the meat.

The meat was appraised by the English method, a description of which was published in the August, 1947, issue of this Journal.

Points are allotted as follows:—

By inspection—

Hams	..	..	..	8
Shoulders	..	..	..	7
Streak	..	..	..	12

By measurement—

Muscle at loin	..	..	28
Thickness of backfat	..	..	20
Length of body	..	..	20
Length of leg	..	..	5

Total possible points 100

It is not often that pig breeders have the opportunity to see the proportions of ham, shoulder, and middle, or the proportions of fat to lean in the bacon rashers of their own pigs. Most pig breeders are generally satisfied that their own pigs are good enough, and when they see some poor-quality bacon in shops or on their breakfast

plates they are inclined to think that it must be the product of their neighbours' pigs and not their own.

Only by following individual pigs through from life to the stage where they are represented as rashers of bacon can one get a proper appreciation of the correlation between the conformation of the live pig and the composition of the resultant bacon and ham. The greatest value of pig-carcass competitions is in providing facilities for such observations and study.

In this competition, all competitors obtained a score card with measurements and points awarded in respect of each part of their pig's carcass from which they can study any defects with a view to remedying them by altering their pig-breeding and feeding practices. In addition, certificates of merit were awarded for each entry which gained 60 per cent. or more of the possible points and seven cash prizes with a total value of £80 and a trophy valued at £15 were made available by the Australian Meat Board.

Sixty entries were penned at the show-grounds but thirteen of them were eliminated after slaughter because they did not comply with the conditions of carcass weight or for other reasons, leaving 47 to be judged for the competition.

The method used in appraising the carcasses depends more on the fixed standards of measurements and photographs of model carcasses, than on the discretion of individual judges. The points awarded are also determined more by the fixed standards than by the opinion of the judge, and therefore the points scored by a carcass have a factual basis. Further, the marking is so drastic that a fair pig gains 50 points, a good pig gains 60 points, only very good pigs gain 70 or more points, while few pigs gain 80 or more points, and it is practically impossible for a pig to gain 100 per cent.

The unusually high standard of the carcasses in this competition is shown by the average of 64.7 per cent. of the possible points gained by the 47 carcasses. Thirty-three carcasses were awarded certificates of merit for having gained 60 or more points, and eighteen carcasses gained 70 or more points, while the winning carcass scored 81 points.

THE PRIZE WINNERS.

The entry winning First Prize of £30 and a case of cutlery valued at £15 was a Large White owned by Mr. L. H. Castle of Bena, and formerly of Clarinda. The winning carcass weighed 179 lb. and was from a pig six months and nineteen days old at time of slaughter.

The second prize of £20 was won by Messrs. I. E. and F. Hawtin, Colac, with a Berkshire.

Three Berkshires exhibited by Messrs. I. E. and F. Hawtin, Colac, W. A. Roy, Boolara, and A. W. and S. Williams, Weerite, were equal in third place.

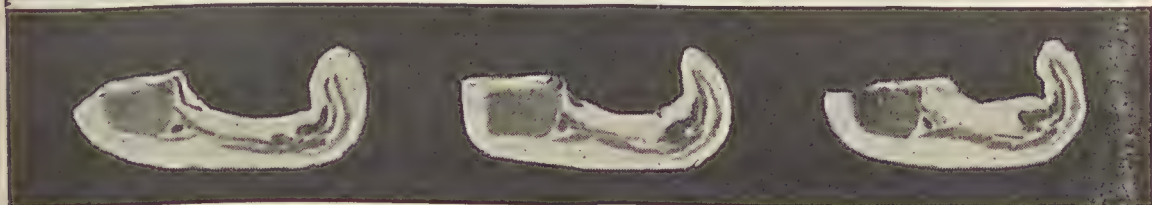
Particulars of the 33 entries which were awarded certificates of merit are shown in Table 1, on page 252.

The overall quality of the 47 carcasses is shown by average percentage of points awarded them for each of the seven features on which they were appraised:—

Hams, 58.4 per cent.; shoulders, 57.7 per cent.; streak, 59.9 per cent.; loin muscle, 65.4 per cent.; fat thickness, 77.4 per cent.; body length, 61.2 per cent.; leg length, 54.8 per cent. Average for all features of the 47 carcasses, 64.7 per cent. of total possible points.



Top row—Left—The loin cut of the 1st prize-winning pig. Right—Loin of the 2nd prize-winner. Second row—Cuts of the three equal-third prize-winners.



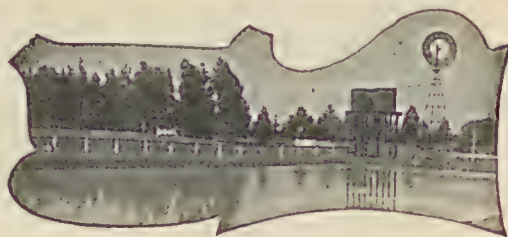
The lower five cuts are from the last five pigs in the competition, in order of merit.



BACON PIG CARCASS COMPETITION

TABLE 1.—PARTICULARS OF THE ENTRIES WHICH GAINED CERTIFICATES OF MERIT.

Place in Competition Awards.	Entry Number.	Name and Address of Exhibitor.	Breed of Pig.	Date of Birth.	Weight of Carcass.	Points Gained from Possible 100.
					lb.	
1	10	L. H. Castle, Bena	Large White ..	23.10.47	179	81
2	27	I. E. and F. Hawtin, Colac	Berkshire ..	3.10.47	152	79 ¹ / ₂
= 3	28	I. E. and F. Hawtin, Colac	Berkshire ..	3.10.47	154	76 ¹ / ₂
= 3	60	W. A. Roy, Morrell's Hill, via Boolarra ..	Berkshire ..	20.10.47	175	76 ¹ / ₂
= 3	70	A. W. and S. Williams, "Hillview Glen Stud", Weerite ..	Berkshire ..	8.11.47	170	76 ¹ / ₂
6	42	C. F. Moore, "Rhonda," Bellbrae	Large White ..	2.9.47	169	75 ¹ / ₂
= 7	19	Fairchild and Clutterbuck, "Vauluse," Tinamba ..	Large White ..	12.11.47	139	75
= 7	44	F. P. Myers, "Boongala," Hunt-road, Bittern ..	Large White ..	23.11.47	163	75
9	71	A. W. and S. Williams, "Hillview Glen" Stud, Weerite ..	Berkshire ..	21.11.47	162	74
= 10	7	R. A. Buller, "Green Acres" Stud, Beaconsfield ..	Large White ..	Oct., 1947	153	73 ¹ / ₂
= 10	61	W. A. Roy, Morrell's Hill, via Boolarra ..	Berkshire ..	21.10.47	160	73 ¹ / ₂
12	21	C. G. Foletta and Son, Acheron Park, Buxton ..	Large White ..	6.11.47	152	73
= 13	20	Fairchild and Clutterbuck, "Vauluse," Tinamba ..	Large White ..	12.11.47	153	72 ¹ / ₂
= 13	24	C. C. Harris, "Egerton Ville," Loch ..	Large White ..	27.9.47	168	72 ¹ / ₂
= 13	69	B. Whelpton, "Hemswell," Whittlesea ..	Berkshire ..	6.11.47	175	72 ¹ / ₂
16	64	R. D. Simpson, "Rosvaudon," Birregurra ..	Large White ..	20.12.47	132	71
17	34	A. C. Kerger, "Barbank," Marshall, via Geelong ..	Large Black ..	11.12.47	180	70 ¹ / ₂
18	62	J. Simmons, Mulgrave	Large White x Middle White—Large Black ..	11.10.47	154	70
19	12	W. Cockbill, "Fulham Park," Rockbank ..	Large White ..	Oct., 1947	153	69 ¹ / ₂
= 20	16	J. K. Dougall, "Forrest Grange" Stud Farm, Hastings ..	Large White ..	22.9.47	158	69
= 20	23	C. C. Harris, "Egerton Ville," Loch ..	Large White ..	25.10.47	177	69
= 20	30	A. R. Haywood, 520 Main-street, Mordialloc ..	Large White ..	10.12.47	140	69
= 20	74	N. J. Moore, "Arkuna Grove," Kewarren, via Colac ..	Large White ..	7.10.47	169	69
= 24	29	A. R. Haywood, 520 Main-street, Mordialloc ..	Large White ..	10.12.47	171	67
= 24	45	F. P. Myers, "Boongala," Hunt-road, Bittern ..	Large White ..	23.11.47	142	67
26	65	R. D. Simpson, "Rosvaudon," Birregurra ..	Large White ..	28.8.47	158	66 ¹ / ₂
= 27	15	J. K. Dougall, "Forrest Grange" Stud Farm, Hastings ..	Large White ..	22.9.47	160	66
= 27	75	N. J. Moore, "Arkuna Grove," Kewarren, via Colac ..	Large White ..	7.10.47	173	66
29	25	C. T. Harrison, "Eastside," Large White Stud, Pomboorneit ..	Large White ..	8.11.47	120	64 ¹ / ₂
30	33	A. C. Kerger, "Barbank," Marshall, via Geelong ..	Large Black ..	11.12.47	162	64
= 31	5	J. E. Bruce, "Bimbimbie," Dewhurst, via Upper Beaconsfield ..	Large White ..	4.11.47	137	63
= 31	6	J. E. Bruce, "Bimbimbie," Dewhurst, via Upper Beaconsfield ..	Large White ..	4.11.47	148	63
31	18	A. Dowie, "Lewisham," Mt. Moriac ..	Tamworth ..	14.10.47	151	63





LIVE STOCK NOTES

Compiled by A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

CALF REARING

THE number of heifer calves raised during the past four years has been well below normal, which means that fewer heifers will enter the milking sheds this year. Adequate numbers of well-grown, strong, robust heifers from high-producing stock are necessary to maintain a good dairy herd. There will then be little danger of the herd falling below strength if culling happens to be a little heavier than usual on account of a run of low producers, or udder or breeding troubles.

The pregnant cows should be well fed between drying off and calving so that the calves will be adequately nourished before birth. Ample good-quality hay and pasture provide the best feed for dry cows.

Immediately after birth, the calf should be allowed to have at least one meal from its mother and then it should be housed for a few days in a warm, dry, clean shed with plenty of straw to snuggle into. Before birth the calf is carried at a temperature of 100°F., and is suddenly born into a temperature averaging about 50°F. For several days it needs protection against such a sudden change of environment.

The calf needs careful attention for several weeks after birth, particularly as regards warmth and feed. For the first few days it needs its mother's milk or colostrum warmed to 100°F. Milk set aside in a bucket this weather soon gets cold, and cold milk will upset a young calf.

Scours are a common ailment amongst small calves, and probably the most common cause is the feeding of luke-warm or cold milk which chills the young calf's stomach. Another cause of scours can also be caused by feeding milk which is too rich, but this can easily be corrected by diluting the milk with water to make it equal to 3.5 per cent. butterfat test. As a calf needs a certain number of nutrients, and as the young animal must get all of these from milk, there is always the danger that too much water may be added, and, if this occurs, the calf will be underfed. The addition of the correct amount of hot or boiling water will assist in warming the milk to the correct temperature. Neither Friesian milk nor the morning milk from Ayrshire, Shorthorn, or Red Poll cows should be diluted.

After the calf is two or three weeks old it can have its ration of whole milk reduced from 6 lb. to 4 lb. per feed and skim milk

or gruel added to make up the nutrients in the milk which are displaced. Further details of how to feed calves both on farms where separated milk is available, and on farms where the whole milk is sold, are fully described in the pamphlet, "Dairy Calves," which is available free of charge on application to the Department of Agriculture, Melbourne, C.2.

[A.C.T.H.]

FEEDING THE DAIRY COW IN WINTER

It is more profitable to feed a cow during the winter than at any other period of the year. More milk is produced, the cow holds her condition better and is more valuable if she has to be culled; she calves in good trim and is able to produce heavy yields from the outset, and she will drop a bigger and stronger calf.

Of late years, Victorian pastures have been greatly developed and improved to produce more feed, and cows should now milk for a much longer period than was the case in the earlier days of dairying. With the sowing down of pastures and top-dressing with superphosphate, increased growth is obtained in the favourable seasons, but not always in the winter season. The spring growth may be trebled or even quadrupled but winter growth, in comparison, is almost at a standstill.

The dairy cow needs a constant and regular supply of feed. She needs about 60 lb. of green grass a day for maintenance, and another 30 lb. for each gallon of milk she produces. On first-class spring pasture she can graze 150 lb. in 24 hours, enough to produce 3 to 4 gallons of milk. On short pasture she will work hard to gather 40 lb. or less of green pasture, and this is insufficient to hold her condition without producing any milk. She will gather about half of this in the daytime and the other half at night. All cows need a good night paddock.

The extra nutrients to keep the cow in condition and produce her milk must be supplied by the farmer, and for economical reasons should be supplied largely from the hay and silage conserved on the farm from the surplus spring growth. The nutrients in hay cost the farmer about $\frac{1}{2}$ d. per pound and most of this cost will be a charge against the normal labour and equipment on the

farm and, therefore, not a direct cash payment from the farmer's account. On the other hand, the nutrients in purchased fodders cost $1\frac{1}{2}$ d. to 3d. per pound, and are obtained only as the result of actual cash payments.

Purchased fodders are recommended to supply deficiencies in the pastures and home-grown supplementary feeds. Further particulars on the feeding of the dairy cow and other farm animals are set out in the pamphlet "Foods and Feeding," which is available free of charge on application to the Department of Agriculture, Melbourne.

[A.C.T.H.]

THE CATTLE COMPENSATION ACT

All cattle owners should be thoroughly conversant with the Cattle Compensation Act. Compensation for certain diseases, namely, contagious pleuro-pneumonia, tuberculosis, actinomycosis, hydatids, Johne's disease, and malignant tumour, is financed in part by the Treasury, and the remainder from the sale of cattle compensation stamps and from penalties recovered in respect of breaches of Parts I. and III. of the Act.

When any cattle are sold, the vendor must, within seven days, transmit to the purchaser a statement of account setting out the date, the number sold, and the amount payable for each animal. To this statement there must be affixed the necessary amount in stamps which must be cancelled in the usual way, and must be rendered whether any payment has been made or not. The amount of stamp duty required is 1d. for each £1 or fractional part of £1, provided that the total for each animal does not exceed 2s. 1d. This is because the maximum market value on which compensation is payable is £25. Failure to carry out this provision of the Act renders the offender liable to a penalty of up to £50.

Compensation, which is at the rate of three-quarters of the market value of the diseased animal (not exceeding £25), shall be payable to the owner of cattle destroyed by order of a stock inspector, dairy supervisor, or approved veterinary surgeon because they are suffering or suspected to be suffering from any of the above-mentioned diseases. Compensation at the prescribed

scale is also paid to butchers for any carcass or portion of a carcass condemned at an abattoir by a meat inspector, or, if none is available, by a veterinary surgeon or medical officer of health, as unfit for human consumption because of these diseases. If only the head is condemned, no compensation is payable. If the forequarters only are condemned compensation is at the rate of one-third of the market value, and, if the hindquarters only are condemned, two-thirds of the market value is paid as compensation. When an animal is slaughtered at an abattoir and portion of the carcass is passed as fit for human consumption, the owner receives payment through the normal channels for that portion of the carcass. A further payment is made from the compensation fund to bring the amount received up to the total due under the Act.

No compensation shall be paid:—

(1) unless the owner makes application for such and supplies the necessary particulars;

(2) if the owner of a visibly-affected case of tuberculosis or actinomycosis has failed to give notice pursuant to the *Stock Diseases Act 1928*, or the *Milk and Dairy Supervision Act 1928*;

(3) unless all stamp duty necessary has been paid (stamped statements should be kept for three years after the date of purchase);

(4) in the case of cattle introduced into Victoria and destroyed because they were suffering or suspected to be suffering from contagious pleuro-pneumonia, if such cattle were destroyed within three months of introduction, unless the Chief Inspector of Stock is satisfied that such cattle became so diseased after introduction or unless they are found free from disease.

All or part of the compensation may be withheld if an owner has been convicted of any offence under this Act or the *Stock Diseases Act 1928*, the *Milk and Dairy Supervision Act 1928*, or Part 13 of the *Health Act 1928*.

There is also a penalty of up to £100 per head of cattle which may be imposed on any person convicted of knowingly buying or selling any diseased cattle with the intention of making a claim for compensation.

[H. TUCKER, B.V.Sc., Veterinary Officer.]

KITCHEN REFUSE FOR PIGS

The recent general fall in store pig prices was attributed to the severe shortage of food which has since become even more acute. There is one source of food which is not being exploited at present to its fullest extent in pig feeding and that is kitchen refuse. Kitchen refuse is also known as kitchen scraps, offal or swill.

The population of Melbourne is one and a quarter million, which, according to investigations made in cities overseas, should provide enough kitchen refuse to produce 13·5 million lb. of pork. The total Victorian production for 1947 was 58,240,000 lb. Other large sources of refuse are the three largest provincial cities, which, on overseas estimates, with a combined population of about 112,000, should provide enough kitchen scraps for the production of another 1,300,000 lb. of pork.

The carcass produced by a refuse or offal-fed pig is not necessarily of the same quality as that of a grain-fed pig; the fat of the former is usually much softer. Refuse-fed pigs do not suffer from worm infestation to the same degree as the grain-fed pigs, and trouble with pig lice is negligible. With careful handling of the refuse, the health of the pigs should be good.



Piglets do better if allowed an occasional run on pasture.

Swill varies in its nutritional value, but generally contains excess quantities of fat, which can be skimmed off as the refuse cools after boiling. Boiling is compulsory under the Regulations of the Stock Diseases Act. The protein content is often high, but if grain is available it may be fed to balance the ration.

The feeding of refuse to sows and litters usually presents some difficulties. As refuse is often fed to pigs enclosed in yards with impervious floors, it is necessary to provide some fresh soil daily or let the sows and litters out on to pasture to avoid stunted anaemic suckers. Refuse is improved as a food for pigs if 2 oz. of crushed limestone is added daily for each sow and 1 oz. per head for other pigs.

If grain is available, it should be fed to sows with litters, weaners, and fattening stock in that order.

[A. D. NORTH, B.Agr.Sc., Science Field Officer.]

MINERAL DEFICIENCIES IN STOCK

It has been known for years that minerals are necessary for the health of animals, and even for life itself, but only recently have investigations revealed the causes and methods of prevention of certain serious diseases due to mineral deficiencies. It is important to remember, however, that the essential minerals can ordinarily be supplied by the careful choice of common food-stuffs, and that only under certain conditions is it necessary to supply mineral supplements.

The most important minerals from the point of view of their deficiency in a ration are salt (sodium and chlorine), potassium, calcium, phosphorus, magnesium, iron, copper, cobalt and iodine.

Both sodium and chlorine are essential to animal life, and they can be cheaply and easily supplied in the form of common salt, either loose or in salt blocks. Animals which sweat a lot need constant supplies of salt, and a horse doing heavy work should receive $1\frac{1}{2}$ to 2 oz. daily. Cattle and sheep too, should have access to salt licks, and while swine and poultry may need less salt it is generally advisable to supply it.

Next to common salt, the minerals most likely to be deficient in the ration of farm minerals are calcium and phosphorus. Calcium and phosphorus compounds make

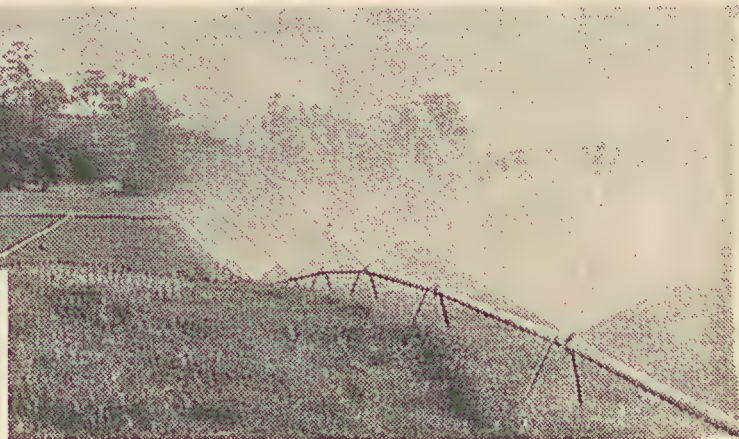
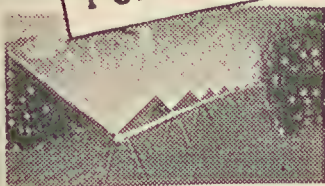
up about three-fourths of the mineral matter in the bodies of farm animals, and over 90 per cent. of that is in their skeletons. They also form more than half the minerals in milk. Therefore, liberal amounts of calcium and phosphorus are needed by growing animals, by those that are pregnant, and by those producing milk. Young animals, particularly amongst cattle and pigs, will develop rickets if fed rations deficient in calcium and phosphorus. In young cattle, the signs of rickets are stiffness, bent and swollen knees, arched back and swollen hocks. Rickets in pigs is characterized mainly by stiffness of the legs accompanied by general unthriftiness.

In the case of mature animals, a deficiency of these minerals causes weakness in the bones which are especially liable to fracture, and the animals so affected often become lame and stiff. Such stock may show a depraved appetite, and will gnaw bones, wood, old tins, &c., and in this way may become affected with botulism or some form of inorganic poisoning. Where top-dressing with superphosphate is not practised, cattle are more likely to suffer from a phosphorus deficiency than a calcium one, whereas the opposite applies with pigs. If it is desired to correct a calcium deficiency in pigs, the best method is to feed ground limestone 1 to 2 per cent. of the feed. Phosphorus can be fed to cattle either in a lick or in the feed in the form of dicalcic phosphate or bone meal.

The minerals iron, copper and cobalt, although they are in very small amount in the body, are all vitally necessary to life since they play an important part in the formation of haemoglobin which carries oxygen to the tissues.

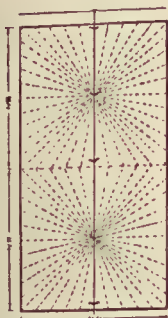
Fortunately, however, there is usually no lack of these minerals in the rations of farm animals, except perhaps, during the suckling period. During this period, especially in the case of suckling pigs fed milk only without access to soil or pasture, there is a danger of anaemia. This disease, in pigs, is commonly known as "thumps." It usually appears in pigs 1 to 6 weeks of age. Affected pigs show paleness of the skin and mucous membranes, lack of vigor, failure to gain normally in weight and labored breathing (thumps). The most practical method of treating the deficiency is to add clean, fresh soil to the pens, or to allow the piglets to run on pasture.

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Shell Ditrene "P"

A New Spray for Aphid Control

For effective control of both green and black peach aphids and black cherry aphid in the late dormant season, the Shell Company recommends the use of their new Spray—Shell Ditrene "P". Combining the insecticidal effects of DDT and petroleum oil emulsions, Ditrene "P" is specifically designed for use on peaches, cherries and nectarines.

Shell Ditrene "P" should be used at the rate of $2\frac{1}{2}$ gallons in 100 gallons of spray mixture, that is, a dilution of 1 part in 40 parts of water by volume. The diluted mixture should be thoroughly sprayed over the trees in the late dormant period.

SHELL

SPRAYING RECOMMENDATION

SHELL SPRAYING OILS FOR ALL FRUITS AND ALL SEASONS

THE SHELL COMPANY OF AUSTRALIA LIMITED (Incorporated in Great Britain)

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Affected pigs may be dosed once at 5 days old with reduced iron, the dose being as much as can be placed on a threepenny piece. Adult animals may suffer from various forms of nutritional anaemia in certain districts where the soil is poor in one or all of these three minerals. Prevention by providing these minerals in licks is usually successful.

There are other essential minerals such as iodine, potassium, magnesium and manganese. These, however, are present in sufficient amounts in any ordinary food ration to supply the requirements of animals. Goitre, caused by lack of iodine in the soil is rare in this country, but where it is known to occur, it can be prevented by supplying small amounts of iodine to pregnant animals so that the offspring are born normal. When young calves are fed on milk without forage or a grain supplement for more than a few weeks they may develop a condition due to lack of magnesium, characterized by blindness, loss of balance, and convulsions.

With regard to manganese, it has been shown that a lack of it in the diet of poultry is responsible for the disease of chicks called "slipped tendon" or perosis, and also that it may play a part in the failure of eggs to hatch. Sufficient manganese is readily furnished in chick rations by adding $\frac{1}{4}$ lb. of manganese sulphate to each ton of feed.

It should be borne in mind that nutritional deficiencies in general are not common ailments, and that once recognized they can be quickly and easily corrected by the intelligent use of mineral supplements.

[B. H. RUSHFORD, B.V.Sc., Veterinary Officer.]

BREEDING FOR EGG QUALITY

While feeding plays an important part in the rearing, egg production, maintenance of health and reproduction of poultry, it is not possible to improve the quality of eggs and egg shells by feeding only.

To obtain the maximum benefits of good feeding, it is necessary to have good hens. The quality of eggs and egg shells are inherited characteristics, and feeding does not completely rectify faults.

The best way to improve the general quality of eggs is by the introduction of

sound breeding principles. All birds selected for breeding should possess the ability to lay good quality eggs of standard size and shape, with strong, smooth shells. As the quality of the chicken is influenced by the quality of the egg, and as first-grade eggs realize highest prices, the benefits obtained by breeding from high-class hens that lay superior-quality eggs cannot be over-estimated. An improvement in quality would increase the percentage of exportable eggs and have a beneficial effect on local consumption.

The life of the chick begins with the development of the embryo which is dependent on the contents of the egg for its growth and development. Under favorable conditions, a good quality egg usually produces a strong, healthy chick, and it is reasonable to assume that an inferior quality egg will produce either a weak chicken or one that will die in the shell.

While good feeding appears to have little effect in improving the quality of eggs laid by poor quality fowls, faulty feeding can upset the quality of eggs laid by desirable types.

[M. D. HALL, Poultry Expert.]

BEE-KEEPING

Not much can be done to colonies during the winter months except to see that they have enough food to carry them through until the spring nectar arrives. It is detrimental to the well-being of the colony to open it up during the cold weather and expose the brood nest. The bees have formed the winter cluster to conserve energy and are in a semi-dormant condition.

If feed is required, insert combs of honey next to the cluster and do not split the cluster under any circumstances, as the bees are formed in a compact mass to generate heat, and keep the colony from being chilled. Muscular activity is relied on within the cluster to generate the heat required, and the bees in the centre of the cluster are continually changing place with those on the outer limits.

See that all hives have a thoroughly waterproof cover, and remove weeds and grasses from the entrance, tilting the hive forward to allow excess water to run down off the floor boards. It is advisable to have about 30 lb. of stores in single colonies for wintering.

[W. A. COLLINS, Apiary Inspector.]

Control of Red Mite on Poultry

Trial with DDT

By D. McQUEEN, B.V.Sc., Veterinary Officer.

THE trial recorded in this article was carried out by the Live Stock Division of the Department of Agriculture in co-operation with the manufacturers of a water dispersible form of DDT. The original aim of the test was to determine the efficacy of different concentrations of DDT suspensions when used as sprays for the treatment of red mite infestation in poultry pens. Later it was decided to compare the effect of tar oil when used for a similar purpose under the same conditions.

It must be appreciated that the detailed research which has been carried out to test the effect of DDT on other parasites appeared to be lacking in the case of the red mite. A number of poultry farmers, however, had decided to experiment on their own farms with commercial preparations of DDT when these became available. Good results were claimed in these practical tests, and the present trial was decided upon to check such findings. Consideration of the life cycle of the parasite and the problems of its control indicates, however, that simple tests carried out by poultry farmers, though valuable to some extent, are too limited in scope to allow a detailed interpretation to be made from the results obtained.

LIFE CYCLE

The salient features of the life cycle of the red mite are as follow:—

1. The adult mite lays its eggs in crevices in perch fittings or elsewhere in the fowl pen.
2. The larvae which hatch from the eggs, gain access to the fowls and remain attached to them for several days.
3. Other stages of the parasite shelter in crevices in the pen or under piles of droppings during the day, and engorge upon the fowls at night. This causes irritation and loss of blood in the fowls, and an additional danger is the transference

of the spirochaete of tick fever from one bird to another. The adult mites, when engorged, are easily visible as dark red spots, but if not engorged they are much smaller, translucent in appearance, and difficult to see unless they are made to move.

4. The life cycle is shortened by high temperature, and the minimum period for its completion is a week.

In the past, it has been considered that any spray used must be capable of killing all stages of the parasite with which it comes into immediate contact, and the perch fittings must be so designed that crevices can be quickly dismantled and sprayed. These measures required perseverance before successful control was achieved, and there was reason to hope that DDT could at least lighten the labour. This was because DDT preparations have been shown in the case of a number of parasites to exert a prolonged residual effect. Flies, for instance, are killed after alighting on a wall sprayed with DDT a few weeks previously. It was hoped to demonstrate this property, not possessed by other treatments, in the case of the red mite.

As soon as sprays such as tar oil or kerosene emulsion have dried, mites are no longer killed when moving over treated areas. During the short time the material is effective, there will probably be some larval mites attached to the fowls, and some adult mites, eggs, and other stages of the parasites sheltering in inaccessible crevices. These form the nucleus of a reinfestation, and the rapidity with which this happens depends on such factors as the efficiency of the spray, how easily the shelters for the mites can be sprayed, and the temperature.

It is apparent that an effective residual effect of any spray would greatly retard this rate of reinfestation. The larvae mites, for instance, would have to contact the

sprayed perches within a few days in order to complete their life cycle. The adult and other stages of the parasite which missed immediate contact with the spray would similarly encounter a film of DDT as they moved over the perches seeking fowls on which to engorge. DDT may differ in its effects on different stages of a parasite. In general, it is ineffective against the eggs, but often effective against the other pre-adult stages. However, this trial could do no more harm than show, by inference from the number of mites found after spraying, whether or not a residual effect existed.

THE TRIALS

The property selected contained a detached row of five pens, with about one hundred birds in each. Pens Nos. 1, 3, and 5 were selected for trial with watery suspensions containing 0.1 per cent., 0.5 per cent., and 1.0 per cent. DDT respectively. The perch fittings were of the type most likely to harbour the mite. Each perch consisted of a board about 4 ft. 6 in. long, nailed at each end to a supporting structure. The latter were made of long boards nailed face to face and attached to posts, thereby forming shelters for mites which could not be treated. The chief site for the parasite was at the perch junctions, and many more were also found under piles of droppings on the perches. The owner stated that his usual routine was to spray every three weeks with Jeye's fluid, but on this occasion had purposely allowed a huge infestation to develop in these pens to provide material for the trial.

The spray was applied over the perch structures, after levering the perches up at each junction, and scraping off the droppings with a spade. A knapsack spray and a small fly spray were provided for the purpose, and about 2 to 3 gallons were used in each pen. The outside of the kerosene-tin nests were also sprayed, as these sheltered a few mites in the tightly-fitting crevices between them. The lower parts of the walls were also covered.

The observations on the first part of the trial were made each week for one month, and are summarized hereunder.

The control pens, Nos. 2 and 4, remained heavily infested. By reference to the summary, the results at the end of one

month can be seen. These indicate that a spray of 0.1 per cent. DDT was too weak to control red mite, and that sprays of 0.5 and 1.0 per cent. DDT were encouraging enough to warrant further observation. It was decided to use the remaining pens, Nos. 2 and 4, to compare the effects of a 1.5-per cent. DDT suspension and tar oil.

Pen No. 2 was selected for trial with a 1.5-per cent. DDT suspension, but on this occasion the spraying was confined to the perch structures. Each perch was not only levered up, as was the case previously, but was completely detached and nailed on again after treatment. The perch structures in pen No. 4 were completely painted with tar oil, and each perch was detached, dipped in the oil, and then nailed on again. Observations on all pens were continued for a further month, and the full results are as follow:—

Summary

Pen No. 1

0.1 per cent. DDT observed over a period of eight weeks.

For four weeks this pen remained heavily infested.

Fifth week—some perch junctions were free of mites.

Sixth week—two moderately large clusters of mites found.

Seventh week—one mite only found at a perch junction.

Eight week—no mites found.

Pen No. 2

1.5 per cent. DDT observed over a period of four weeks.

First week—two very small clusters of mites found at two perch junctions.

Second week—two mites found.

Third week—one mite found.

Fourth week—no mites found.

Pen No. 3

0.5 per cent. DDT observed over a period of eight weeks.

First week—one mite found between the nests.

Second week—a small cluster of mites found at one perch junction.

Third week—very small clusters of mites found at about half the junctions.

Fourth week—similar to third week.

Fifth week—very small clusters of mites found at two perch junctions.

Sixth week—two mites found.

Seventh week—four mites found at three perch junctions.

Eight week—two mites found.

Pen No. 4

tar oil—observed over a period of four weeks.

First week—two fairly large clusters of engorged mites found at two perch junctions.

Second week—more large clusters of engorged mites found.

Third week—same as second week.

Fourth week—two large clusters of engorged mites found at two perch junctions with smaller clusters at other junctions.

Pen No. 5

1.0 per cent. DDT observed over a period of eight weeks.

First week—no mites found.

Second week—a small cluster of mites found at one perch junction.

Third week—several small clusters of mites found at several junctions.

Fourth week—same as third week.

Fifth week—very small clusters of mites found at about a third of the perch junctions.

Sixth week—several mites found—these were more engorged than before.

Seventh week—no mites found.

Eighth week—no mites found.

Observations from Trial

The observations reveal the numbers of mites found in the most likely sites, and not the numbers which might still be hidden in more inaccessible places. Pen No. 1, treated with 0—1 per cent. DDT remained heavily infested for one month, but appeared to become free during the following four weeks. It is most difficult to suggest a reason, but it is possible that this weak concentration of DDT affected pre-adult stages to a greater degree than the adults, thus leading to a much slower diminution in the number of mites in this pen as

compared with the others. It is improbable that the mites move from pen to pen, but if this was the case, then the presence next door of the 1.5 per cent. DDT might have produced this result.

In any case, it would be wise to use at least a 1.0-per cent. suspension of DDT for control of red mite in practice, although the 0.5-per cent. spray seemed nearly as effective as both the 1.0 per cent. and the 1.5 per cent., as evidenced by the virtual disappearance of mites at the perch junctions within two months, and the very small numbers found during the period of observation.

The summary shows that the number of mites found in the pen treated with tar oil, at each observation, was much greater than in the pens treated with the three stronger concentrations of DDT. Furthermore, these mites were heavily engorged, which was only rarely the case in the other three pens. It can be assumed that the water suspension of DDT used in this trial exerted a residual effect on the red mite when applied to the perch structures, and that the tar oil was potent for only a short period.

Encouraging as the results appear for the control of this parasite, the earlier warning of the limitations of this test must be emphasized. There are many questions relevant to the problem of control which are not answered, including the nature of the residual effect on different surfaces and the effect of dust and droppings on the perches.

NOTE.—The preparation used in the above trial was made by Taubman's Ltd.

Fume Taints in Cream

Precautions should be taken to prevent milk or cream becoming tainted by odours from the exhaust gases of oil engines used to drive milking machines or separators. Kerosene or crude-oil engines are worse in this respect than petrol engines, but all types can be troublesome.

Taints arising from absorbed oil or petrol fumes are a common cause of de-graded cream, and for this reason, oil engines should be partitioned off with a fume-proof wall from the milk or separator room. The engine exhaust should be so placed that the prevailing winds do not blow the fumes through the ventilators or windows into the separator room. Where the roof of the dairy premises is used as a water catchment, the exhaust should be prevented from discharging or blowing on to the roof, otherwise there is a danger of the water becoming tainted.

[Contributed by the Dairying Division.]

IN THE ORCHARD

By G. W. Gayford, B.Agr.Sc., Senior Horticultural Instructor

PLANTING YOUNG FRUIT TREES

THE months of June and July, when the trees are completely dormant, is the best time for planting out young deciduous nursery stock. The bundles of trees when received from the nursery should be opened out, and, if it is not possible to plant immediately, the young trees should be "heeled in" by digging a trench wide and deep enough to contain the roots. Place in the trench and cover the roots firmly with soil. Provided the roots are well covered the trees may be left in the trench until the middle of July.

A method of setting out a new orchard is described in a leaflet, "Setting out a Block of Fruit Trees", which may be obtained free of charge on application to this Department.

Fruitgrowers are becoming more aware of the considerable soil losses which occur by the old "square" methods of planting combined with cultivation up and down slopes. Planting trees on "grade" lines with a very slight slope almost approaching the contour has many advantages. The main ones are in avoiding a downrush of water during summer thunderstorms when the soil is in a cultivated loose condition, and also in retaining most of the useful rainfall which occurs during the growing season of the trees. Growers contemplating this method of planting may obtain further information on application to this Department.

Assuming that the new orchard has been set out and the tree-planting sites are marked with stakes, the next task is to set the nursery trees in their permanent position. Whether the trees be planted on the square or on the contour, it is desirable that they should occupy the exact position indicated by the stakes. This can best be achieved by the use of a planting board which consists of a piece of timber about 2 ft.



Using a dumpy level to set out an orchard on the contour system.

6 in. long with a 1-in. hole at each end through which two round pointed pegs are fitted. A notch is cut in the centre of the board. This board is then placed on the ground with the stake indicating the tree's position fitting closely into the notch. The two pegs at either end of the board are driven into the soil and the board and stake are removed, but the pegs are left in position. The hole for the tree may then be dug and the board replaced over the two pegs. The tree will then occupy the same position as the stake when it is held firmly against the notch in the board.

The hole for the tree should be just wide enough and deep enough to contain the roots. There is no advantage in digging a large, deep hole and filling it with loose material with the supposed effect of improving the drainage. In fact, this may only act as a basin of waterlogged soil in wet seasons, resulting in the early death of the tree.

It is also doubtful whether any special fertiliser treatment is required for the newly-planted tree. If a large quantity of organic manure is dumped into the hole before planting, this mouldy material would certainly have a bad effect on root growth. A small quantity of fertiliser, such as blood and bone, castor meal, or "complete" fertiliser, mixed with the soil which is to be returned to the hole, would be beneficial in poor soils.

Treatment of the Tree before Planting

When the tree is removed from the nursery, most of its roots and all the fine feeding roots are left in the ground. After the tree is planted it will produce new rootlets arising from dormant buds in existing roots. Before planting, all broken roots should be pruned back and any strong roots should be cut shorter than weaker roots to give the tree a chance to develop a balanced root system. The tree should be placed in the hole with the strongest roots pointing into the prevailing wind.

In replacing the soil around the tree, the tree should be held upright and at a level slightly higher than that at which it was growing in the nursery. By gently shaking the tree up and down as the soil is returned to the hole, it will ensure good contact of soil around all the roots, and then the top soil can be firmed by trampling.

In the north of the State, it may be necessary to water the trees soon after planting during dry seasons.

WINTER PEST CONTROL

Bryobia Mite

Bryobia Mite was more than usually troublesome during the past season, and caused considerable leaf fall on some apple trees, particularly the Delicious variety. The increased infestation seemed to be associated with the use of DDT sprays. Some growers used summer sprays of a new material, hexa-ethyl-tetra-phosphate, with good results against this pest. However, there are plenty of mite eggs to be seen in apple and pear orchards, and growers would be well advised to spray their trees thoroughly with red oil, 1 in 20, as late as possible before bud burst.

Woolly Aphis

Red oil, 1 in 20, will also have a controlling effect on woolly aphis, which has been plentiful this year. This spray should be regarded as essential by all growers who have used DDT or propose to use it next season, so that the mite-egg population surviving the winter will be at a minimum.



Planting board used to place tree in position.

Green Peach Aphis

Green Peach Aphis again caused considerable damage to peach trees in the Goulburn Valley and the metropolitan district last season. Sprays of DNC, 1 in 35, or tar distillate, 1 in 40, thoroughly applied to peach trees will kill most of the eggs if applied between the end of June and the middle of July. The word "thoroughly" is emphasized. The fact that most of the infestations commence at the tops of the limbs indicates that these were probably missed in the previous spraying, and that a completely drenching spray of winter washes is vital for success against this pest.

Standard Herd Records

The Standard Herd Records for pure-bred dairy cows for the quarter ended 31st March, 1948, will shortly be available for distribution. Copies may be obtained on application to the Superintendent of Dairying, Department of Agriculture, Melbourne, C.2.

Transportation of Sheep by Motor Vehicle

Requirements of Sheep Owners' Protection Act

Contributed by the Live Stock Division

THE attention of sheep-owners and others is directed to certain provisions of the Sheep Owners' Protection Act, which require that sheep transported by road in a motor vehicle must be accompanied by a permit. This authority is issued by a Permit Officer appointed under the Act, and the travelling of sheep without such permit constitutes an offence entailing liability to prosecution and a penalty.

Permits may be issued by any one of the persons described in Section 3 of the Act, and these include every member of the Police Force, every stock inspector and dairy supervisor of the Department of Agriculture, every Secretary of any Agricultural Society, every Municipal Councillor, Justice of the Peace, Commissioner for taking Affidavits, male Head Teacher, every licensed auctioneer, and certain others by appointment of the Minister.

The principal requirements of the Act are:—

Section 4

(1) Subject to this section, any permit officer may issue to any person who makes an application therefor a travelling sheep permit entitling him to carry sheep by road in or on a motor car.

(3) Every applicant for a permit shall furnish the person to whom the application is made with such information as is necessary for the issue of the permit.

(4) Every permit issued under sub-section (1) of this section shall remain in force for a period of seven days from the date of the

issue of the same and shall be in the prescribed form and shall set out—

(a) the name and address of the applicant;

(b) a sufficient description of the sheep in respect of which it is issued;

(c) a statement of the maximum number of such sheep;

(d) a statement of the number of the car in or on which it is proposed to carry such sheep;

(e) a statement of the place from which and the place or places to which and the route or routes by which it is proposed that such sheep be carried; and

(f) such other particulars as are prescribed.

(6) A permit shall not be issued to any applicant unless the person to whom the application is made is satisfied—

(a) that the applicant is the owner of the sheep in respect of which the application is made; or

(b) that the application has the consent or authority of the owner of such sheep to carry such sheep in or on a motor car from the place from which and to the place to which it is proposed that such sheep be carried.

(7) Any person who for the purposes of any application pursuant to this section makes any statement which is not correct or furnishes any particulars which are not correct shall be guilty of an offence against this Act.

Section 5

Any driver of a motor car in or on which sheep are carried along any road shall, unless he has in his possession a permit which is in force in respect of such sheep, be guilty of an offence against this Act.

Provided that this section shall not apply in the case of the owner of any sheep, or any person with the authority or consent of such owner carrying any such sheep in or on a motor car from one part to another part of such owner's property over not more than ten miles of road, or in the case of a mob travelling on the hoof, from carrying any such sheep unable to travel.

Section 6

(1) Any officer of the Department of Agriculture authorized in that behalf whether generally or in any particular case, and any member of the Police Force may require the driver of any motor car in or on which any sheep are being carried along any road, to produce for inspection a permit in respect of such sheep and to state his name and address.

(2) If such driver fails or refuses to produce for inspection any such permit which is in force or refuses to state his name and address or states a false name or address he shall be guilty of an offence against this Act.

(3) Any person who is required as aforesaid to state his name and address and who refuses to state his name and address or gives a false name or address, may be apprehended (with or without a warrant) by any member of the Police Force who shall take such person before a justice to be dealt with according to law.

Section 7

(1) Every auctioneer or his employee before taking delivery of any sheep for sale by such auctioneer, shall in all cases where such sheep are carried in or on any motor car for the purposes of such delivery—

(a) demand and receive a permit which is in force in respect of such sheep; and

(b) compare such sheep with the description in the permit—

and every auctioneer shall within seven days after receiving any such permit as aforesaid sign his name thereon and forward such permit to the nearest police station:

Provided that where any such sheep are carried in or on any motor car for the purposes of such delivery, and the person delivering such sheep states to the auctioneer that a permit was issued to him in respect of the carriage of such sheep in or on a motor car to the place of sale, and is in force but has been lost, the auctioneer may take delivery of such sheep if he knows the owner of the sheep to be a reputable person and if a substitute permit (issued by some person other than the auctioneer) is obtained and delivered to him forthwith, and any such substitute permit shall for the purposes of this Act be deemed to be a permit.

(2) Every auctioneer or his employee who takes delivery of any sheep for sale by such auctioneer in any case where such sheep are carried in or on any motor car for the purposes of such delivery shall if such sheep do not correspond with the description contained in the permit received as aforesaid in respect of such sheep be guilty of an offence against this Act.

Section 8

Every person who forges any permit or fraudently alters any particular contained in any permit shall be guilty of a misdemeanour and be liable to a penalty of not more than One hundred pounds or to imprisonment for a term of not more than twelve months.

STUD SHEEP

Special permits to breeders of stud sheep—and which are effective for a period of twelve (12) months—may be obtained on application to the Chief Veterinary Inspector, Department of Agriculture, Melbourne. Such permits cover transport of sheep—

(a) to or from any specified railway station;

(b) to or from any agricultural show;

(c) to or from any property (not being a market).



CARCASS INVESTIGATIONS

RIB AND TEAT COUNT ON THE PIG

By A. D. North, B.Agr.Sc., Science Field Officer.

THE length of carcass of a pig is known to be related to the number of ribs it possesses and, to investigate the correlation between rib number and teat number, an investigation was carried out during 1947, in various bacon factories, on a sample of typical Victorian bacon pigs.

In an article published in 1929, Professor A. M. Shaw of the University of Saskatchewan, Canada,⁽¹⁾ stated: "There appears to be a direct correlation between the number of ribs and the placing of the carcasses (in carcass competitions) provided, of course, that quality and finish are equal in every case". Professor Shaw found that the number of rib pairs varied between 13 and 17 attached to the thoracic (chest) vertebrae. He confirmed investigations of others who had found there was no variation in the number of cervical (neck) vertebrae (7) or sacral (rump) vertebrae (4), but that

the lumbar (loin) vertebrae varied in number from 5 to 7. It would seem logical to suppose that the pig with the greatest number of vertebrae would be longer and therefore possess a greater percentage of middle. This is supported by J. A. Freeman of the Michigan Experiment Station, in an article published in 1939⁽²⁾.

PROCEDURE

During the investigation in Victoria, 3,071 carcasses were handled. Ribs on one side only were counted, because factory routine prevented a more detailed study. Consequently no figures were obtained for side variation, which is known to exist. In some animals there was difficulty in determining whether "floating ribs" at the posterior end of the carcass were in fact ribs joined to the vertebral column, or pieces of cartilage with no attachment,

Care was taken to avoid errors under these circumstances. No attempt was made to determine any variation in the number of lumbar (loin) vertebrae.

Practically all of the 3,071 pigs used in the test were of bacon weight and most of them had some Large White in their breeding. Only three variations were found in the number of ribs per pig, namely 14, 15, or 16 pairs.

TABLE 1.—SHOWING RIB COUNT ON 3,071 PIG CARCASSES (ONE SIDE ONLY).

			Fourteen Ribs.	Fifteen Ribs.	Sixteen Ribs.
Number	..	..	839	1,917	315
Percentage	..	..	27.3	62.4	10.3

The average number of ribs was 14.8.

TABLE 2.—RIB COUNT OF MALES AND FEMALES COMPARED.

		Fourteen Ribs.		Sixteen Ribs.	
		Male.	Female.	Male.	Female.
Number	..	395	444	177	138
Percentage	..	12.9	14.4	5.8	4.5

The sex and number of teats were noted only in pigs having 14 or 16 pairs of ribs. It will be seen from Table 2 that there were 572 males and 582 females in the 1,154 pigs examined.

On the 947 carcasses examined for teat numbers, no effort was made to distinguish between blind and normal teats. The number of teats varied from 10 to 18. Only one pig possessed 18 teats and none had 17 teats.

In Table 3 it will be seen that only one pig with 16 pairs of ribs had less than 12 teats and only one pig with 14 pairs of ribs had more than 15 teats.



An attractive side of bacon showing a good proportion of middle.

TABLE 3.

Ten Teats.		Eleven Teats.		Twelve Teats.		Thirteen Teats.		Fourteen Teats.		Fifteen Teats.		Sixteen Teats.	
Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.
A.—PIGS WITH SIXTEEN PAIRS OF RIBS (256).													
..	..	..	1	9	7	27	25	67	50	32	18	13	6
..	..	..	0.4%	3.5%	2.7%	10.5%	9.8%	26.2%	19.5%	12.5%	7.0%	5.1%	2.3%
N.B.—One male with eighteen teats.													
B.—PIGS WITH FOURTEEN PAIRS OF RIBS (691).													
10	7	24	23	79	64	73	98	121	165	11	15	1	..
1.4%	1.0%	3.5%	3.3%	11.4%	9.3%	10.6%	14.2%	17.5%	23.9%	1.6%	2.2%	0.14%	..

An analysis of these figures gives the following results:—

Average number of teats for females with 16 pairs of ribs, 13·9.

Average number of teats for males with 16 pairs of ribs, 14·1.

Average number of teats for females with 14 pairs of ribs, 13·2.

Average number of teats for males with 14 pairs of ribs, 13·0.

These figures suggest that producers who place importance on the teat number of their breeding stock are working along the right lines, for there appears to be a definite correlation between teat number and rib number.

SUMMARY

(1) Of 3,071 pig carcasses examined, 27·3 per cent. had 14 pairs of ribs, 62·4 per cent. had 15 pairs of ribs, and 10·3 per cent. had 16 pairs of ribs.

(2) The mean number of ribs was $14·829 \pm ·011$.

(3) With an increase in rib number there was an increase in teat number.

REFERENCES.

(¹) Shaw, A. M.—Variations in the Skeleton Structure of the Pig. *Scientific Agriculture* Vol. X., No. 1, September, 1929.

(²) Freeman, J. A.—Variations in the Number of Vertebrae of Swine. *J. of Heredity*, Vol. XXX., No. 2, 1939.

Electric Water Heaters in the Dairy

It is desirable to open the drain-plug of electric water heaters every few months to permit the soft sludge which often accumulates in the bottom to be removed. This should be done only after the sludge has had an opportunity to settle, that is, just prior to milking. Formation of a soft sludge from some waters is quite normal, but, if allowed to accumulate unduly, the effectiveness of the heater will be reduced. The drain plug is about 1 inch in diameter and placed on the lowest part of the heater. If there is any difficulty in identifying the plug, or doubt as to the procedure outlined, reference could be made to a plumber or to the State Electricity Commission.

The plug should be removed only long enough to ensure a good flushing, and it is not necessary to allow more than 2 or

3 gallons of water to escape to enable this to be done. Under no circumstances should the heater be allowed to drain completely.

Before any action is taken to remove the plug, however, it is essential to turn off the "booster" element. After flushing, the heater should be refilled immediately.

The exhaust pipe at the top of the heater should be kept open, as a scale, sufficient to close the pipe, may form, particularly if the water is mineralized. If the pipe becomes completely blocked, a vacuum will be created in the body of the heater, causing the walls to collapse.

[Contributed by the Dairying Division.]

Vegetable Seed Certification and Approval Schemes

List of Onion Seed Growers for 1947-48 Season

By R. F. Henderson, B.Agr.Sc., Horticultural Research Officer

OWING to the increased demand for seed of established varieties, the development of varieties more suited to local conditions, and restrictions on importation of some overseas seed, the vegetable seed-growing industry in this State is increasing in importance, and it is the policy of this Department to encourage growers to produce high-quality seed.

Assistance is rendered to growers by means of certification and approval schemes which ensure the supply of reliable, true-to-type, disease-free seed in packages sealed and tagged by the Department.

CERTIFIED ONION SEED

The aim of onion seed certification is to stabilize the Victorian-grown onion varieties by selecting for uniformity and general conformity to type. This is being obtained by the following practice:—

- (1) Selecting bulbs, as near as possible to the ideal shape set down for each variety.
- (2) Selecting bulbs well covered with several good sound skins, rejecting mis-shapen and thick-necked bulbs.
- (3) Eradicating the Red Rocca strain from the brown varieties.

The improved type of bulb being grown as a result of this work and the favourable reports from local and overseas sources have led to an encouraging response to certification and many producers are now realizing the benefit obtained from use of highly selected seed.

Stocks of the seed listed hereunder are still available for intending growers.

GROWERS OF CERTIFIED ONION SEED CROPS FOR 1947-48 SEASON.

Grower.	Address.	Acres.
AUSTRALIAN BROWN.		
Baxter, J. C.	Bellarine	1
Burns, Allan	Corunnun	1
Carmody, E. P.	Coragulac	$\frac{1}{2}$
Carmody, J. J.	Bullock Swamp	$1\frac{1}{2}$
Finlay, E.	Coragulac	1
Henderson, J.	Portarlington	6
Hutchinson, J. B.	Drysdale	$\frac{1}{2}$
Hutchinson, W. A. and Sons	Drysdale	5
Kahl, M.	Murgheloluc	2
Lindsey, P. H.	Woodford	12
Morrissey, J. P., Jnr.	Alvie	1
O'Shanassy Bros.	Cororooke	1
Roache, J.	Nalangil	$\frac{3}{4}$
Sheehan, W. H.	Killarney	$1\frac{1}{2}$
Whitecombe, R. A.	Drysdale	$1\frac{1}{2}$
BROWN GLOBE.		
Burns, Alex	Corunnun	$\frac{3}{4}$
Burns, Allan	Corunnun	1
Finlay, E.	Coragulac	1
Lindsey, P. H.	Woodford	4
Morrissey, J. P.	Alvie	$\frac{1}{2}$
O'Shanassy Bros.	Cororooke	$\frac{1}{2}$
Sheehan, W. H.	Killarney	1
IMPERIAL WHITE SPANISH.		
Henderson, J.	Portarlington	3
Mills, W. E.	Koo-wee-rup	12

A list of growers of certified French bean seed and of approved tomato and pea seed, will appear in the July issue of this Journal.

IN THE GARDEN

By T. H. Kneen, B.Agr.Sc., Principal, School of Primary Agriculture and Horticulture, Burnley Gardens.

DON'T NEGLECT PATHS

On this page appear two illustrations of a lawn in a typical suburban allotment. The informal path so evident in the lower picture is present in both, but, in the upper picture, it has been so overgrown with creeping lawn grasses that it no longer serves any utilitarian or aesthetic purpose. Cleared of the overgrowth of grass the path was restored to its original usefulness, both as a path and as a pleasing ornamental feature in the garden.

One point, a fundamental one in laying out paths, is clearly shown in the photograph, namely, that the outside edges of paths should be more or less parallel. A path of the kind shown is suitable only for light traffic, the slabs being rather widely spaced. If, however, the pathway presented a solid appearance, it would have the effect of dividing the garden into two parts. Note that the path leads quite naturally in graceful curves to a gate at the bottom of the garden, the curves adding much to the value of the path as an ornamental feature.

With this type of path it is necessary that the lawn be kept closely cut as otherwise the gradual thickening of the turf will cause the slabs to become catchments for water in wet weather or whenever the lawn is watered. On a perfectly level lawn it is difficult to prevent this happening, but generally, close cutting, combined with a slight fall in the lawn, will enable the walk to be kept dry at all times.

LIFTING AND STORING DAHLIAS

Now is the time to lift and store dahlia tubers. The tops of the plants should be cut off about 6 inches above ground and, after a few days, the tubers lifted carefully and stored in a sheltered position on well-drained ground under a shady tree or hedge.



Garden path before and after clipping away the grass from around edges of slabs.

Label the clumps with the variety names so as to retain their identity when divided in the spring.

Tubers from plants which showed unhealthy foliage and made poor growth alongside apparently healthy and vigorous plants should be discarded. Unfortunately, dahlias are subject to a virus disease known as Spotted Wilt, the control of which is extremely difficult. Rather than encourage the spread of this type of disease it is better to discard diseased plants.

ROSE PRUNING

June and July are the best months to prune roses. In areas where frosts are late, pruning is best carried out towards the end of this period to avoid damage to the young tender shoots which follow pruning.

An unpruned rose bush generally becomes bare towards the base and produces flowers only sparsely. The best treatment for each plant is a matter of experience gained from the application of some basic principles and the experience of others. The benefits of pruning are nicely-shaped plants which produce more and better blooms, and a longer useful life.

Not all roses are pruned in winter. The climbing clustered or Wichuraiana types, such as Dorothy Perkins and Paul's Scarlet Climber, flower in the spring and bear their flowers on the canes formed in the previous season. Pruning consists of removing most of the older canes after they have flowered in the spring by pruning close to the soil or above a vigorous vegetative shoot near the soil.

Ordinary climbing roses, such as Black Boy and Climbing Chateau de Clos Vougeot, differ in taking four or five years to replace the old canes. The aim, therefore, is to retain and develop one or two new canes each year to replace ultimately the old canes when they have lost their vigour. Lateral growths on the canes retained should be cut back in the winter to two or three buds of the past season's growth.

Another exception to winter pruning is the popular Australian rose, Lorraine Lee, which is best pruned, not too heavily, in summer (February) to encourage blooms in the winter, its normal flowering period.

The main object of pruning is to maintain a supply of vigorous young growths and to allow each of these adequate room for development. The first step is to remove any dead and diseased wood, and small weak growths, as well as some of the oldest unproductive main branches.

In a young bush it is sound policy to open up the centre of the bush to some extent, while in older plants some central shoots might be cut back with advantage to produce some inside growth. Remember that all cuts should be made cleanly and

hard against the parent branch. A bush pruned each year will usually produce one or two good strong growths from the base of the plant (not to be confused with suckers) from the root stock, and these should be used to replace any old branches removed.

After the initial tidying of the bush, pruning consists of shortening back the past season's growth on leaders or main arms, and any long lateral growths, to a strong healthy bud, preferably one facing away from the centre of the bush, to encourage lateral spread.

Weak-growing roses should be pruned lightly. Vigorous varieties, such as Texas Centennial, will stand quite heavy pruning. Many rose bushes grow weakly on one side, in which case the growths on the weak side should be pruned lightly and left longer than those on the strong side.

HERBACEOUS PERENNIALS

Most herbaceous perennials can be divided during their dormant season and benefit by being lifted and divided every three or four years. They can be cut back to the ground now, but division is best deferred until the early spring when growth is just starting.

PEST CONTROL

Gardeners have now become accustomed to the fact that DDT is not a "cure-all" for all insect pests in the flower garden. However, it has proved most helpful in measures for the control of some important pests such as codling moth, harlequin bug, thrips, and aphids. When replenishing the garden medicine chest, don't forget to include a supply of DDT dust and DDT emulsion. The emulsion is similar in appearance to the familiar white oil emulsion, but is used at a greatly reduced strength. DDT emulsions usually contain 20 per cent. of the active ingredient, and the usual concentrations used are equivalent to 1 fluid oz. of the emulsion to 1 gallon of water. However, stronger and weaker concentrations may be required in special circumstances, and it is therefore wise to study the manufacturers' recommendations before making up mixtures. "Wettable DDT" is a different form again and may contain 50 per cent. DDT and therefore a different degree of dilution is necessary.

[continued on page 272]

THE VEGETABLE GARDEN

By George Hyam, Horticultural Supervisor

ASPARAGUS

THE soil for a new asparagus bed should be prepared early in June. Asparagus will grow in most soils though it prefers light loams or sand. Heavier soils can be improved by working in an extra amount of stable manure which contains plenty of straw, or better still, the crowns can be covered with some introduced light soil.

The success of asparagus depends largely upon the preparation given before planting, and, as the bed will last from fifteen to twenty years, special care is well worth while. The most convenient width for a bed is 4 feet, but, as this is best raised, about 7 feet should be marked out to provide extra soil. Trench this area to a depth of at least 2 feet as asparagus is a deep-rooting plant. When breaking up the subsoil with the fork, dig in a liberal quantity of stable or other organic manure, incorporating it in the soil and not placing it in layers.

The bed should be well drained and preferably situated in a sunny position. A 4 ft. bed can be planted with a double row, and a length of 30 feet will provide for the 40 plants which are sufficient for the average household needs. If it is necessary to construct two or more shorter beds, space them 2 feet apart. Actual planting details will be described in next month's notes.

The foliage of established asparagus beds should now be cut off to ground level and the surface lightly forked over and left in the rough until next month. Apply $\frac{1}{2}$ lb. of agricultural lime to each square yard of bed.

Preparations for planting rhubarb are also made in June. New beds should be dug over and heavily manured as for asparagus. In both cases a 10-in. layer of manure would not be too much to dig in to a new bed, and any lesser quantity should be supplemented by blood and bone dressings. Rhubarb should be divided and replanted every fourth year.

OTHER CROPS

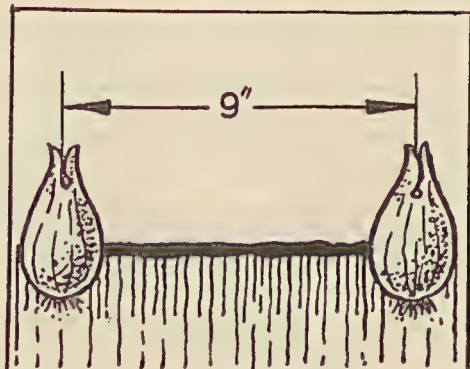
Odourless and Early Globe onion seedlings are planted out this month, and seed of Brown Globe, Australian Brown, and White Imperial onion is sown in seedbeds or direct in the beds. Leeks can be planted in all districts, and there is still time to sow successional crops of turnips and swedes for late spring use.

Seed of Parisian cabbage is sown in southern areas and seedlings of this variety are planted out in northern areas in June.

In the south, sowing of lettuce is best deferred until July, but June is a good time to sow the New York and Imperial 615 varieties in districts north of the Divide.

VEGETABLES FROM BULBS

Tree onions and shallots are planted in June from bulbs selected from last season's crop. Tree onions are planted in firm ground with their necks slightly underground and spaced 6 inches apart. To obtain good bulbs from shallots, the soil must be firm and the sets are pushed into the surface so that the neck and part of the shoulder of the set is above ground. They need 8-in. spacing. Garlic is planted differently. Draw a drill about 2 inches deep; plant a clove every 9 inches along this depression, but do not cover the sets



Shallots should be planted by pressing the bulbs half-way into the firm soil as illustrated.

with soil during the winter. The drill is not filled in until August or until the tops are seen to sprout. A small planting of these vegetable bulbs will provide a variety of onion-like flavouring and they can be used for the same purposes as the common onion. They need no manure or special soil conditions.

CULINARY HERBS

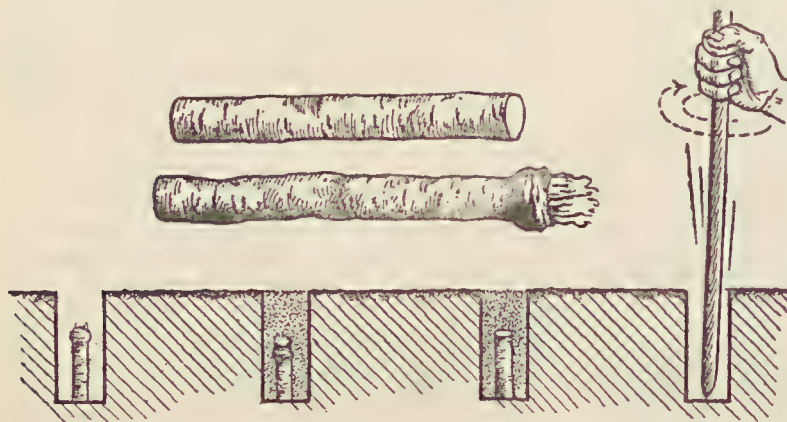
After about the third year, it is best to break up and divide the clumps of sage, thyme, and marjoram. Take rooted pieces of side-shoots and plant these out this month; the centre portions can be rejected. Seedlings and struck cuttings of herbs are best planted out in early spring.

Runners of mint should be lifted and their old woody roots discarded. Mint

should be lifted annually, otherwise it is apt to become a nuisance, extending its runners into adjoining vegetable plots.

The foliage of chives should be cut back to ground level, and, where plants have been in the ground for two or three years the clumps should be divided and replanted. Cut back the old stems of any herbs that are not to be lifted, to within 2 inches from soil level. Too much cultivation around herbs is not advisable, but in June, the bed can be lightly forked, working in a little blood and bone. Mint beds should be lightly top-dressed with old manure or compost.

Horseradish, when properly planted, is always useful. To obtain good, straight roots, plant out cuttings in June as shown in the illustration. The soil should not be manured, and the cuttings should be about 4 inches long, planted 10 inches deep, and spaced 12 inches apart. Pack the soil tightly round the cuttings. Horseradish planted this way will produce parsnip-like roots instead of almost useless forked roots which result from pieces left carelessly in the ground. Horseradish should be lifted and replanted every year.



Method used for planting horseradish. Cuttings may be with or without crown, but should be straight.

GARDEN NOTES (continued from page 270).

The following are examples of the uses of DDT in the home garden:—

Codling Moth

Use DDT emulsion at the rate of 1 fluid oz. to 10 pints of water, first when the flower petals have fallen and thence at four-weekly intervals until mid-January.

Cabbage White Butterfly

Many do not realize that this insect is also a serious pest of stocks which are likely to be seriously damaged, especially

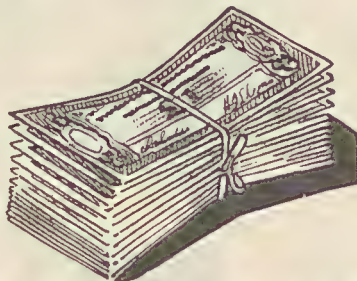
when raised and planted out early in autumn. This insect is conveniently dealt with by the use of DDT dusts. An excellent hand duster can be obtained for less than 10s. and will quickly repay the outlay involved.

DDT sprays should not be used indiscriminately, as full information is not yet available as to the reaction of many kinds of plants. However, if care is taken to use it at the correct concentration, it is unlikely that any noticeable damage will result.



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INSECTICIDES, FUNGICIDES, SHEEP DIPS

BRANDS REGISTERED FOR 1948

By W. R. JEWELL, M.Sc., Chemist for Agriculture

THE list for 1948 of registered brands of fungicides and pest destroyers is given in the following pages and should be kept for reference by all users of such materials. The list should be self-explanatory, but if the reader requires further information, or any advice on chemical aspects of spray materials, he should apply to the Chemist for Agriculture, State Laboratories, Melbourne, C.2.

The list contains 466 different brands, which shows a slight increase on last year. The brands are grouped under a number of classifications for the convenience of the reader. Many of the classifications cover well-established types of material that have been in use for many years. For a number of these, standards have been proclaimed; where a standard is in force, all brands of that particular type must comply with the standard.

There has been a further increase in the number of brands containing D.D.T., supporting the contention expressed earlier that such preparations were likely to assume a prominent position. While it is again stressed that D.D.T. is not a cure-all, further investigations have confirmed its efficiency against certain pests, and advice on the pests against which it is likely to be effective is obtainable from the Department. It will be seen from the list that the guaranteed analysis is in terms of the para para isomer of dichloro-diphenyl-trichlorethane, the particular form of D.D.T. which is effective against pests. Different grades of D.D.T. may have different percentages of this particular, and active, isomer, so that it is not the content of total D.D.T., but of the para para isomer, which must be guaranteed.

A new type of insectide, appearing for the first time this year, is Gammexane. This organic compound, more correctly known as benzene hexachloride, occurs in the form of four different isomers of which one, the gamma isomer, is the active one. Hence, the guarantee in respect to these preparations is in terms of the percentage of the gamma isomer. Gammexane, or 666 as it is also known, is another new chemical likely to find a permanent place as an insecticide, but further investigation is necessary before the full range of insects against which it is effective can be given. It will be seen that gammexane sheep dips have been registered and indications are that these will be very effective.

For the guidance of sellers and buyers of pest destroyers, it is desirable to outline briefly the main provisions of the *Fungicides Acts* 1928 and 1935, which require the annual registration of all brands of insecticides, fungicides, vermin destroyers and weed killers. The "wholesale dealer", the person primarily responsible for placing the pest destroyer on the market in Victoria, is the person required by the Act to make application for registration. The application must be approved by the Director of Agriculture, and it is an offence to sell an unregistered product.

The application for registration must state the nature and percentage of active constituents present in the material, and these must also be shown on the label attached to packages. From this label, the purchaser is informed of the nature of the material he is purchasing. Inspections are made of stocks of pest-destroyers, and samples taken for analysis; if the analysis shows the sample to be below guarantee in any active constituent, legal proceedings may be instituted.

List of Fungicides, Insecticides, Vermin Destroyers and Weed Destroyers Registered at the Office of the Director of Agriculture under the Fungicides Act 1935 (No. 4295) for the Year, 1948.

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).					Wholesale Dealer.
	Arsenic Pentoxide (As ₂ O ₃) Calculated on the Dry Basis.		Addity Calculated as Nitric Dry Basis.	Content of Water.		
	Total.	Water Soluble.		Maximum.	Maximum.	
	Minimum.	Maximum.	Maximum.	Maximum.	Maximum.	
<i>Arsenate of Lead (Paste).</i>						
Hipple	32-0	50	2	50-0	50-0	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Berger's Mercury	31-0	50	2	50-0	50-0	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
Blue Bell	31-0	50	2	50-0	50-0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant	31-0	50	2	50-0	50-0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Lion	31-0	50	2	50-0	50-0	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Ramtre	31-5	25	2	50-0	50-0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Vallo	32-0	50	2	50-0	50-0	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Tip Top	31-0	50	2	50-0	50-0	Law, Sonmer Pty. Ltd., 21 Elizabeth-street, Melbourne
Pannifex's	31-0	50	2	50-0	50-0	H. C. Pannifex and Co. Pty. Ltd., 53-57 Munster-terrace, North Melbourne, N.1
Paka	32-0	50	2	50-0	50-0	Fruit Packers Associated Pty. Ltd., 395 Collins-street, Melbourne
Lane's	31-0	32	2	50-0	50-0	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne
Challenge	32-0	50	2	50-0	50-0	Wright, Stephenson and Co. (Aust.) Pty. Ltd., 34 Queen-street, Melbourne
<i>Arsenate of Lead (Powder).</i>						
Blue Bell	31-0	50	2	50	..	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Arsnette	31-0	50	2	50	..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Flephant	31-0	50	2	50	..	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Lion	31-0	50	2	50	..	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Ramtre	31-5	25	2	50	..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Plane	31-0	50	2	50	..	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
Vallo	32-0	50	2	50	..	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Sigma	32-0	50	2	50	..	Sigma Co. Ltd., 562 Little Bourke-street, Melbourne
Berger's Mercury	31-0	50	2	50	..	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
Pannifex's	31-0	50	2	50	..	H. C. Pannifex and Co. Pty. Ltd., 53-57 Munster-terrace, North Melbourne
Lane's	31-0	50	2	50	..	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne
Challenge	32-0	50	2	50	..	Wright, Stephenson and Co. (Aust.) Pty. Ltd., 34 Queen-street, Melbourne
Tip Top	31-0	50	2	50	..	Law, Sonmer Pty. Ltd., 21 Elizabeth-street, Melbourne
<i>Calcium Arsenate.</i>						
Hipple	40-0	..	..	..	..	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Elephant	40-0	..	..	..	..	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Lion	40-0	..	..	..	..	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Vallo	40-0	..	..	..	..	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Tip Top	40-0	..	..	..	..	Law, Sonmer Pty. Ltd., 21 Elizabeth-street, Melbourne

cc

Blyth's	..	Copper (Cu)	25.0	..	..	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Jacquets	..	"	25.0	..	..	Jacquets Pty. Ltd., 31 Queen-street, Melbourne
Maclefeld	..	"	25.0	..	..	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne, C.I
Neptune	..	"	25.0	..	..	" " " " " "
Neptune Snow	..	"	25.0	..	..	" " " " " "
" (Neige Crystals)	..	"	25.0	..	..	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
" (Powdered)	..	"	25.0	..	..	" " " " " "
" (Bordeaux manufacture)	..	"	25.0	..	..	" " " " " "
E.S.A.	..	"	25.0	..	..	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Hart's Sugar Bluestone	..	"	25.0	..	..	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Hipple	..	"	25.0	..	..	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
<i>Basic Copper Salts.</i>						
I.C.I. A.N.Z. (Basic Carbonate)	..	Percentage Copper (Cu.)	%	Percentage Copper (Cu) Water Soluble.	Percentage through 200-mesh Sieve.	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
Smutoil (Oxychloride)	..	52.0	..	Nil	99.0	"
Vallo Anti-Bunt (Oxychloride)	..	52.0	..	Nil	99.0	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Cuprox (Oxychloride)	..	52.0	..	Nil	99.0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Elliott's Bunticide	..	50.0	..	..	..	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
Vallo Copper Spray (Oxychloride)	..	50.0	..	..	..	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Oxi-Cop. (Oxychloride)	..	50.0	..	..	..	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne
Copper-50-Spray	..	50.0	..	..	..	Wright, Stephenson and Co. (Aust.), Pty. Ltd., 34 Queen-street, Melbourne
Challenge (Oxychloride)	..	50.0	..	..	..	G. W. Allan, 328 Flinders-street, Melbourne
Solkosan (Oxychloride)	..	50.0	..	..	..	"
<i>Bordeaux Mixture.</i>						
Hipple (powder)	..	Copper (Cu)	12.50	..	..	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Lion (powder)	..	"	12.50	..	..	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Vallo (powder)	..	"	12.50	..	..	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Lane's (powder)	..	"	12.50	..	..	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne
Bord-O-Kwik (paste)	..	"	17.5	..	..	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
<i>Burgundy or Copper-Soda.</i>						
Neptune Copper Spray	..	Copper (Cu)	12.5	..	..	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
Blue Ball	..	"	12.0	..	..	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant	..	"	12.0	..	..	Jacquets Pty. Ltd., 31 Queen-street, Melbourne
<i>Paris Green.</i>						
Felton, Grimwade, and Duerdin's	..	Arsenious Oxide (As ₂ O ₃)	50.0	..	..	Felton, Grimwade, and Duerdin's Pty. Ltd., 342-6 Flinders-lane, Melbourne
Nosco	..	"	50.0	..	..	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne
Up Top	..	"	55.0	..	..	Law, Sommer Pty. Ltd., 21 Elizabeth-street, Melbourne

LIST OF FUNGICIDES; ETC., ETC.—continued.

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).	Wholesale Dealer.																																							
<i>Miscellaneous Copper Compounds.</i>																																									
Hippie Cheshunt Compound ..	Copper (Cu) 4.0 (on dry basis) ..	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond																																							
Bordilnette ..	" 12.7 ..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne																																							
Bordlesan Colloidal Copper ..	" 15.0 ..	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne																																							
<i>Lime.</i>																																									
Neptune ..	Available Lime (CaO) 80 ..	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne																																							
<table><tr><th>Thio-Sulphate Sulphur.</th><th>Poly-Sulphide Sulphur.</th><th>Total Soluble Sulphur.</th></tr><tr><td colspan="3">Weight in Volume.</td></tr><tr><td>%</td><td>%</td><td>%</td></tr><tr><td>2.5</td><td>20.0</td><td>28.0</td></tr><tr><td>2.5</td><td>20.0</td><td>28.0</td></tr><tr><td>2.5</td><td>20.0</td><td>28.0</td></tr><tr><td>2.5</td><td>20.0</td><td>28.0</td></tr><tr><td>2.5</td><td>20.0</td><td>28.0</td></tr><tr><td>2.5</td><td>20.0</td><td>28.0</td></tr><tr><td>2.5</td><td>20.0</td><td>28.0</td></tr><tr><td>2.5</td><td>20.0</td><td>28.0</td></tr><tr><td>2.5</td><td>20.0</td><td>28.0</td></tr><tr><td>2.5</td><td>20.0</td><td>28.0</td></tr></table>			Thio-Sulphate Sulphur.	Poly-Sulphide Sulphur.	Total Soluble Sulphur.	Weight in Volume.			%	%	%	2.5	20.0	28.0	2.5	20.0	28.0	2.5	20.0	28.0	2.5	20.0	28.0	2.5	20.0	28.0	2.5	20.0	28.0	2.5	20.0	28.0	2.5	20.0	28.0	2.5	20.0	28.0	2.5	20.0	28.0
Thio-Sulphate Sulphur.	Poly-Sulphide Sulphur.	Total Soluble Sulphur.																																							
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2.5	20.0	28.0																																							
2.5	20.0	28.0																																							
2.5	20.0	28.0																																							
<i>Concentrated Lime-Sulphur (Solution).</i>																																									
Hippie ..	2.5	20.0																																							
Blue Bell ..	2.5	20.0																																							
Elephant ..	2.5	20.0																																							
Lion ..	2.5	20.0																																							
Neptune ..	2.5	20.0																																							
Vallo ..	2.5	20.0																																							
X.L. ..	2.5	20.0																																							
Harola ..	1.5	20.0																																							
Challenge ..	2.5	20.0																																							
Tip Top ..	2.5	20.0																																							
<table><tr><th>Sulphur.</th><th>Calcium Hydrate.</th></tr><tr><td>%</td><td>%</td></tr><tr><td>62.5</td><td>35.5</td></tr><tr><td>64.0</td><td>35.6</td></tr><tr><td>66.0</td><td>33.0</td></tr></table>			Sulphur.	Calcium Hydrate.	%	%	62.5	35.5	64.0	35.6	66.0	33.0																													
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%	%																																								
62.5	35.5																																								
64.0	35.6																																								
66.0	33.0																																								
<i>Lime and Sulphur (Dry Mix).</i>																																									
Pannifex ..	62.5	35.5																																							
Vallo ..	64.0	35.6																																							
X.L. Sulph. and Agral ..	66.0	33.0																																							
H. C. Pannifex and Co. Pty. Ltd., 53-57 Munster-terrace, North Melbourne Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne																																									

Commonwealth (Dusting)	Sulphur	%	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
" (Powdered)	99.5	"	"
" (Atomic Dusting)	90.0	"	"
" (Atomic)	99.5	"	"
" (Wetomic)	97.0	"	"
Flotox	95.0	"	"
Lion (Atomic)	95.0	"	H. C. Pannifex and Co. Pty. Ltd., 53-57 "Munster-terrace," North Melbourne
Neptune (Powdered)	99.0	"	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Vallo (Powdered)	99.5	"	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
" (Dusting)	90.0	"	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
" (Wettable)	98.0	"	"
" (Colloidal)	50.0	"	"
Ramtre Dust No. 39	99.0	"	Ramsay and Treganowan Ltd., 475 "Latrobe-street," Melbourne
Wetoul	97.0	"	"
Plane (Dusting)	90.0	"	N. N. McLean Pty. Ltd., 393 "Queen-street, Melbourne"
Blue Bell (Colloidal)	50.0	"	Blyth Chemicals Ltd., 31 "Queen-street, Melbourne"
Elephant (Colloidal)	50.0	"	Jaques Pty. Ltd., 31 "Queen-street, Melbourne"
Hippie (Dusting)	50.0	"	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Tromax (Powdered)	100.0	"	Sigma Co. Ltd., 562 Little Bourke-street, Melbourne
Spegan	55.0	"	Spreng Colloidal Sulphur Pty. Ltd., 90 "Queen-street, Melbourne"
Csran (Colloidal)	50.0	"	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne
Spersul	73.0	"	Ramsay and Treganowan Ltd., 475 "Latrobe-street, Melbourne"
Ramtre (Wettable)	97.0	"	"

Nicotine Sulphate.

	Nicotine	%	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Hippie	40	"	Blyth Chemicals Ltd., 31 "Queen-street, Melbourne"
Blue Bell	40	"	Jaques Pty. Ltd., 31 "Queen-street, Melbourne"
Elephant	40	"	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Lion	38	"	N. N. McLean Pty. Ltd., 393 "Queen-street, Melbourne"
Plane	40	"	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Vallo	40	"	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
Black Leaf 40 (Neptune)	40	"	"
Xepurine	40	"	"
Grazcos	40	"	"
Sigma	40	"	"
Hart's	40	"	The Graziers' Co-operative Shearing Co. Ltd., 90 "William-street, Melbourne"
Nik-kof	40	"	Sigma Co. Ltd., 562 Little Bourke-street, Melbourne
	40	"	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
		"	Clark, King and Co. Pty. Ltd., 237 "Queen-street, Melbourne"

Tar Distillate.

	Tar Oil	Phenols	Mineral Oil	Emulsifiable Oils	%	Ramsay and Treganowan Ltd., 475 "Latrobe-street, Melbourne"
Ovicide					48	"
Vallo Ovicidal Wash					10	"
Blue Bell					20	"
Elephant					89	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Hippie					89	Blyth Chemicals Ltd., 31 "Queen-street, Melbourne"
Winterwash A					89	Jaques Pty. Ltd., 31 "Queen-street, Melbourne"
					70	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Wintrol (Tar Oil Wash)					50	Ramsay and Treganowan Ltd., 475 "Latrobe-street, Melbourne"
Phenols					8	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne
Mineral Oil					12	"
Tar Oil					75	Wright, Stephenson and Co. (Aust.), Pty. Ltd., 34 "Queen-street, Melbourne"

Benzol Emulsion.

Vallo	Benzol	30	%	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
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Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).	Wholesale Dealer.
<i>White Spraying Oil or Emulsion.</i>		
Hippie	White Mineral Oil 80.0 ..	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Blue Bell	" " 82.0 ..	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Albocum	" " 80.0 ..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Elephant	" " 82.0 ..	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Gargoylle	" " 82.5 ..	Vacuum Oil Co. Pty. Ltd., 29 Market-street, Melbourne
Kleenup	" " 83.0 ..	H. C. Pamflet and Co. Pty. Ltd., 53-57 Munster-terrace, North Melbourne
Lion	" " 80.0 ..	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Neptune	" " 84.0 ..	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
Vallo (Clarifol)	" " 83.0 ..	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Volck	" " 83.0 ..	H. C. Pamflet and Co. Pty. Ltd., 53-57 Munster-terrace, North Melbourne
Shell White Spray	" " 84.0 ..	Shell Co. of Australia Ltd., 163 William-street, Melbourne
X.L.	" " 80.0 ..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Atlantic	" " 86.0 ..	Atlantic Union Oil Co. Ltd., 396 Collins-street, Melbourne, C.I
Albarol	" " 72.0 ..	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne
Challenge	" " 80.0 ..	Wright, Stephenson and Co. (Aust.), Pty. Ltd., 34 Queen-street, Melbourne
Tip Top	" " 90.0 ..	Law, Sonner Pty. Ltd., 21 Elizabeth-street, Melbourne
<i>Pale Spraying Oil.</i>		
Gargoylle	Pale Mineral Oil 82.5 ..	Vacuum Oil Co. Pty. Ltd., 29 Market-street, Melbourne
Neptune	" " 85.0 ..	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
Shell Pale-Spray	" " 85.0 ..	Shell Co. of Australia Ltd., 163 William-street, Melbourne
Shellicide D.	" " 85.0 ..	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Vallo	" " 82.0 ..	Wright, Stephenson and Co. (Aust.), Pty. Ltd., 34 Queen-street, Melbourne
Phallenge	" " 70.0 ..	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne
Lane's	" " 80.0 ..	
<i>Red Spraying Oil.</i>		
Hippie	Red Mineral Oil 85.0 ..	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Blue Bell	" " 85.0 ..	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant	" " 85.0 ..	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Gargoylle	" " 85.0 ..	Vacuum Oil Co. Pty. Ltd., 29 Market-street, Melbourne
Gargoylle Mayonnaise	" " 82.5 ..	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Lion	" " 80.0 ..	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
Neptune "A"	" " 83.0 ..	Shell Co. of Australia Ltd., 163 William-street, Melbourne
Shell Red Spray	" " 83.0 ..	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Vallo	" " 85.0 ..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
X.L.	" " 85.0 ..	
X.L. (Emulsion)	" " 82.0 ..	Atlantic Union Oil Co. Ltd., 396 Collins-street, Melbourne, C.I
Atlantic	" " 89.0 ..	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne
Harbas	" " 76.0 ..	Law, Sonner Pty. Ltd., 21 Elizabeth-street, Melbourne
Tip Top	" " 80.0 ..	

Winter Spraying Oil.

Shell Universal Winter Spray	..	Nitrated Phenols	85-0	..	Shell Co. of Australia Ltd., 163 William-street, Melbourne
Winsol	..	"	82-0	..	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
Vallo D.N.C.	..	"	85-0	..	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville

Miscellaneous Spraying Oil.

Carsine D.N.O.C. Dormant Ovicidal Spray	{	Mineral Oil	..	72-0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
D.N.C. (Spraying Oil)	..	Dinitroorthocresol	..	2-0	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne
		Mineral Oil	..	80-0	
		Dinitroorthocresolate	2-5	..	

Arsenic (Oxides).

Vallo (White)	..	Arsenic (As ₂ O ₃)	..	98-0	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Hart's (Pentoxide) Granulated	..	Arsenic Pentoxide (As ₂ O ₅)	99-5	83-0	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Felton, Grimwade, and Duerdin's	..	"	98-0	..	Felton, Grimwade, and Duerdin Ltd., 342-6 Flinders-lane, Melbourne

Snail and Slug Killers.

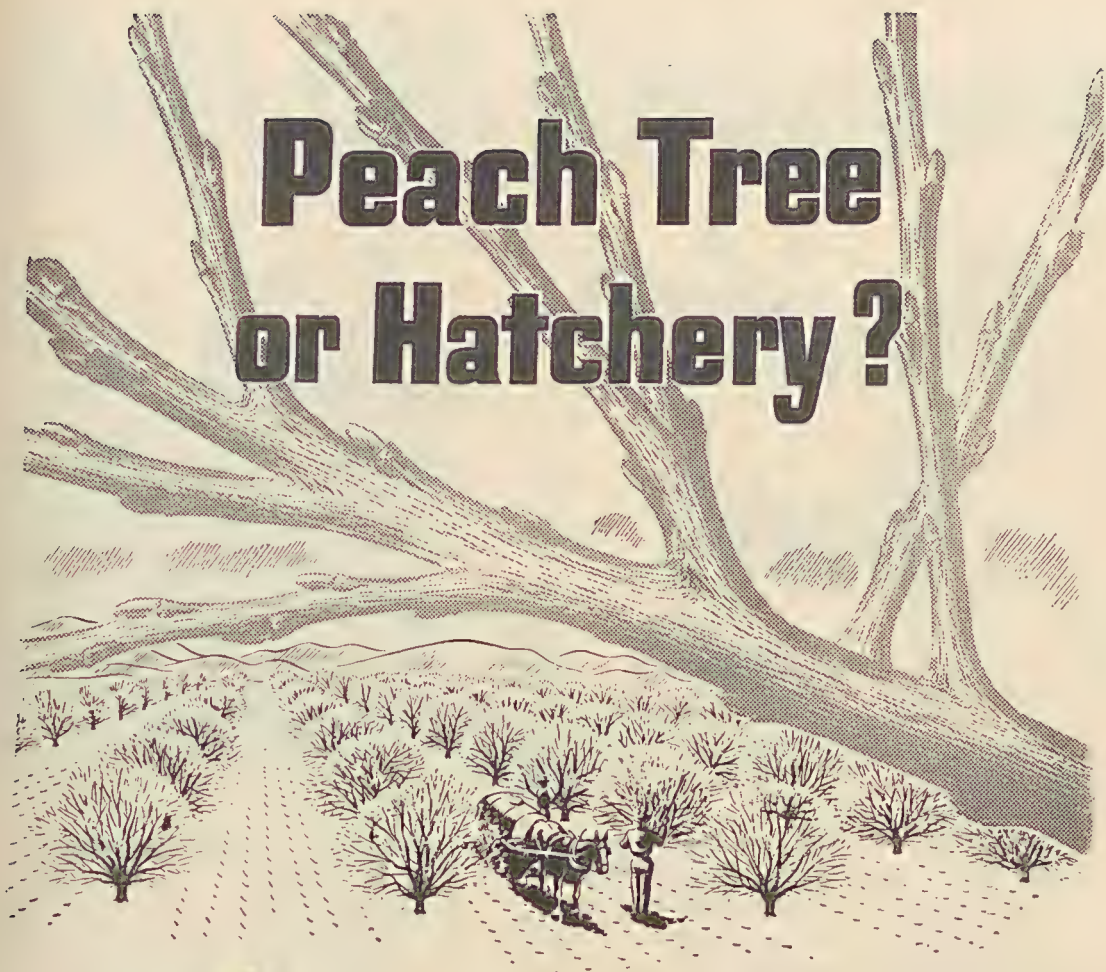
Bug-Geta	..	Metaldehyde	..	1-5	Guano Plant Force and Pest Control Co., 53-57 Munster-terrace, North Melbourne
Sure Death	..	"	..	1-5	Sure Death Laboratories, 2A Lunan-avenue, Drumcondra, Geelong
Defender	..	"	..	1-25	Law, Sommer Pty. Ltd., 21 Elizabeth-street, Melbourne
Eat-N-Die	..	"	..	1-0	Kag Manufacturing Co., 4 Wood-street, Fitzroy
Slugtox	..	"	..	1-5	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Brown Magic	..	"	..	1-0	E. H. Page, 1264 High-street, Malvern
Instant 265	..	Metaldehyde	..	1-4	M. A. B. Grant, Beaconsfield
		Arsenic (As ₂ O ₃)	..	75	
K.O. 4	..	Metaldehyde	..	1-0	A. B. Gibson and Sons Pty. Ltd., cr. Stubbs and Robertson streets, Kensington
Taylor's No. 13	..	Sodium Fluosilicate	..	10-0	T. S. Nettelford and Sons Pty. Ltd., 189 King-street, Melbourne
Metaslug	..	Metaldehyde	..	1-46	Ormond Plant Farm Pty. Ltd., Lillimur-road, Ormond
Killsem	..	"	..	1-0	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne
Snaildeath	..	"	..	1-5	Shift-It Products, 4 Roden-street, Melbourne
Avery	..	"	..	1-5	R. Avery Fertilizer Co. Pty. Ltd., 25 Victoria-place, Carlton
Betabait	..	"	..	1-5	Hodge, Moody and Co. Pty. Ltd., 5 Gordon-street, Richmond
Stirling	..	"	..	1-0	Stirling Nurseries, Beach-road, Torquay

Miscellaneous.

Felton, Grimwade, and Duerdin's Formalin	..	Formaldehyde	..	38-0	Felton, Grimwade, and Duerdin Pty. Ltd., 342 Flinders-lane, Melbourne
I.C.I. A.N.Z. Carbon Disulphide..	..	Carbon Disulphide	..	99-0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
Vallo (Orchard Tree Bands)	..	D.D.T.	..	1-0	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Shirlan A.G.	..	Beta-Naphthol	..	20-0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
"	..	Salicylanilide	..	23-0	"
"	..	Sulphonated Organic Matter	..	98-0	"
Certesan	..	Sodium Salicylanilide	..	100-0	"
"	..	"	..	1-5	"
Germisan	..	Mercury	..	30-0	Dalgety and Co. Ltd., 461-71 Bourke-street, Melbourne
		Sodium salt of Cyan-mercury cresol	..	60-0	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
		Sodium chloride	..	..	

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).	Wholesale Dealer.
<i>Miscellaneous—continued.</i>		
Lunasan	Organically combined mercury .. 54	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Agrosan	" 1-5	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
Tubercol	Stearoptenes and Oleoptenes .. 70-0	H. C. Panfiliex and Co. Pty. Ltd., 53-57 Munster-terrace, North Melbourne
Grenedeth	Nicotine .. 0-58	E. H. Page, 1264 High-street, Malvern
Clensel	Sulphur .. 18-19	Clensel Products Pty. Ltd., Youell and Cowper streets, Footscray
	Paradichlorobenzene .. 2-27	
	Residual Oil .. 4-22	
	Naphthalene .. 2-60	
	Oil of Citronella .. 2-0	
Killamite Manurial Insecticide ..	Ammonia .. 2-3	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
	Potash Soap .. 60-0	
	Naphthalene .. 10-0	
	Tar Acids .. 1-0	
	Copper .. 1-0	
Fluorocide	Sulphur .. 2-0	Sulphates Pty. Ltd., 395 Collins-street, Melbourne
Wilto Soil Treatment ..	Sodium Aluminium Fluoride .. 90-0	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne
	Ethyl mercury phosphate .. 0-5	
	Paradichlorobenzene .. 3-0	
	Copper .. 12-0	
	Phenol .. 5-5	
Jen's Poultry Louse Powder ..	Sodium fluosilicate .. 12-5	Jen's Vet. Products, 443 Little Collins-street, Melbourne
	Tar Salts .. 2-5	
	Sulphur .. 2-5	
	Tobacco dust .. 2-5	
	Formaldehyde .. 38-4	
Sickle Formalin	" 40-0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
Hipple Formalin	Beta Naphthol .. 10-0	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Lane's Tree Bands ..	D.D.T. .. 2-0	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne
	Naphthalene .. 50-0	
Vallo Manurial Insecticide ..	Sulphur .. 5-0	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Shell D-D Fumigant	Chlorinated Hydrocarbons .. 100-0	Shell Co. of Aust. Ltd., 163 William-street, Melbourne
Hexone	Hexaethyl tetraphosphate .. 95-0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Tetroc	Tetrachloroparabenzquinone .. 99-0	Wright, Stephenson and Co. (Aust.), Pty. Ltd., 34 Queen-street, Melbourne
Tetroc Seed Protectant ..	" 100-0	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne
Aretan	Mercury .. 3-0	G. W. Allan, 328 Flinders-lane, Melbourne
Destruxol	Nicotine .. 12-0	Ormond Plant Farm Pty. Ltd., Lillimur-road, Ormond
	Sodium Cyanide .. 8-0	
	Carbolic Acid .. 2-0	
	Wood Creosote .. 20-0	
	Nicotene .. 0-6	
Destruxol Emulsion ..	Phenols .. 1-0	Felton, Grimwade, and Duerdin's Pty. Ltd., 342 Flinders-lane Melbourne
	Creosote Oil .. 5-5	
	Sodium Arsenite .. 0-12	
Felton's Argentine Ant Poison ..	Phenyl Mercuric Acetate .. 2-5	E. P. Keogh Ltd., 402 Swanston-street, Melbourne
Keolized Mercury E		

Peach Tree or Hatchery?



Don't let overwintering Aphis eggs hatch into a new generation of Green and Black Aphis pests. One thorough application of Winterwash "A" applied to peach trees during the dormant period will eradicate these eggs and ensure freedom from Aphis attack in the coming season. Winterwash "A"—dependable tar-distillate spray recommended by Departments of Agriculture.



1PHY—M24



WINTER WASH 'A'

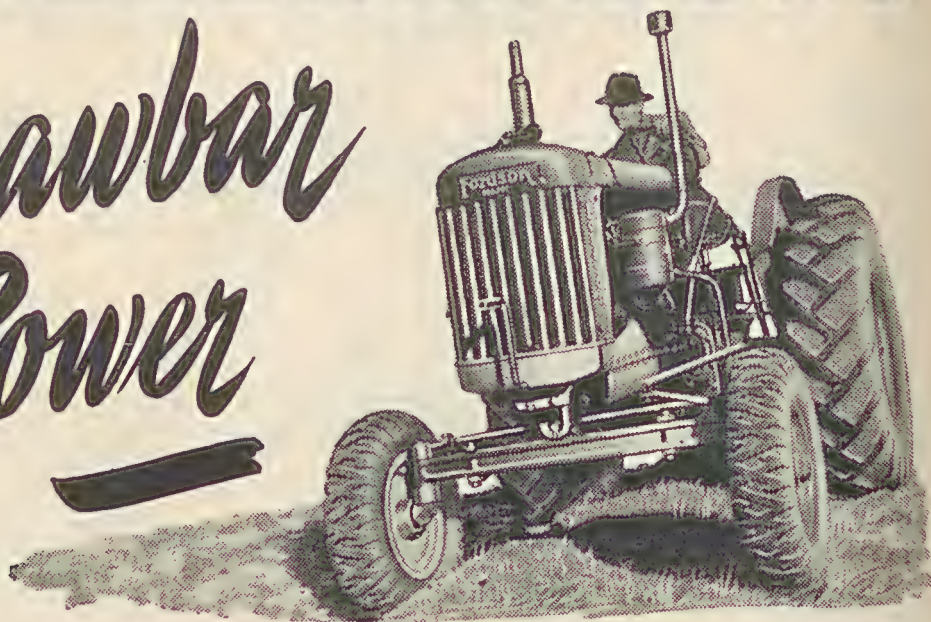
(TAR DISTILLATE SPRAY)

AN I.C.I. PLANT PROTECTION PRODUCT

VICTORIAN DISTRIBUTORS: RAMSAY & TREGANOWAN LIMITED.

The New Power in the Land ...
FORDSON MAJOR'S

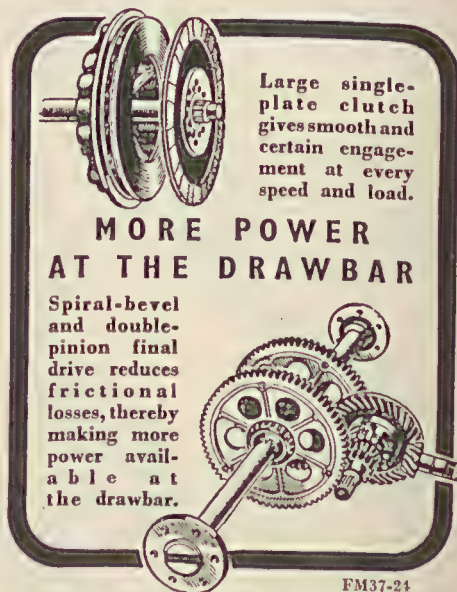
*Drawbar
 Power*



Fordson "Major" has the rugged strength and ample power necessary for Australian Agriculture, in jobs ranging from small mixed farming to broad acres cultivation.

This power-in-the-paddock is not obtained by increased fuel consumption or slower working speed, but comes from vital features of design. These advances include a high compression, high turbulence cylinder head; improved carburettor and vaporising system, new clutch and final drive.

Other "for better work" features are:—marine-type, polar inductor magneto, weather and dust proof: two air cleaners: independent rear wheel brakes (optional Agricultural models). Optional equipment that adds to Major's versatility includes, electric starting and lighting, hydraulic power lift, power-take-off.



Large single-plate clutch gives smooth and certain engagement at every speed and load.

**MORE POWER
 AT THE DRAWBAR**

Spiral-bevel and double-pinion final drive reduces frictional losses, thereby making more power available at the drawbar.

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Enquire from your State Distributor:

**MALCOLM MOORE PTY. LTD., 300 City Road, South Melbourne, Vic.
 OR FROM YOUR LOCAL FORDSON DEALER**

FORD MOTOR COMPANY OF AUSTRALIA PTY. LTD. (INC. IN VIC.) REG. OFFICE: GEELONG, VIC.

Nicotine Dusting Powders.

Plane Nicodust No. 3 ..	Nicotine	3.00	..	..	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
" " " " No. 5 ..	"	5.00	..	..	"
Elephant Duston No. 1 ..	"	4.00	..	..	Jaques' Pty. Ltd., 31 Queen-street, Melbourne
Ramire No. 4 ..	"	2.00	..	..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
" " " " No. 5 ..	"	3.00	..	..	"
" " " " No. 6 ..	"	4.00	..	..	"
Vaillo N.40 ..	"	2.50	..	..	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Victory ..	"	2.00	..	..	Victory Dusts, 317 St. Kilda-street, Middle Brighton

Arsenical Dusting Powders.

Plane A.P. No. 50 ..	Arsenic Pentoxide (As ₂ O ₅)	15.5	..	..	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
Ramire No. 17 ..	"	"	..	..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
" " " " No. 19 ..	"	"	..	..	"
Vaillo "A.L." 50 ..	"	16.0	..	..	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Perfection No. 1 ..	"	"	..	..	S. G. Marriott, Ferntree Gully-road, Notting Hill
Victory No. 1 ..	"	23.5	..	..	Victory Dusts, 317 St. Kilda-street, Middle Brighton
Lane's A.P. 50 ..	"	"	..	..	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne

Copper Dusting Powders.

Plane Coppodust No. 7 ..	Copper (Cu)	7.00	..	..	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
" " " " No. 11 ..	"	11.00	..	..	"
Ramire No. 14 ..	"	8.00	..	..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Bordo Bordeaux ..	"	8.75	..	..	Victory Dusts, 317 St. Kilda-street, Middle Brighton
Bordo Dust ..	"	9.00	..	..	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne

Rotenone Dusting Powders.

Plane Rotodust No. 125 ..	Rotenone	1.25	..	..	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
Pulvex ..	"	1.00	..	..	New Zealand Loan and Mercantile Agency Co. Ltd., 538 Collins-street, Melbourne
Drymac ..	"	.25	..	..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Katakilla ..	"	1.00	..	..	"
Derrisdust ..	"	0.75	..	..	Houghton and Byrne Pty. Ltd., 268 Flinders-street, Melbourne
Derris Dust ..	"	0.75	..	..	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne

D.D.T. Dusting Powders.

Plane Noride No. 100 ..	D.D.T.	1.00	..	..	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
" " " " No. 200 ..	"	2.00	..	..	"
Hipple ..	"	2.00	..	..	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Peapuf No. 2 ..	"	2.00	..	..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Deadust ..	"	2.00	..	..	"
No-Yerm ..	"	2.00	..	..	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne
Taubman's ..	"	2.00	..	..	Taubman's Pty. Ltd., 24 Lonsdale-street, Melbourne
" " " " 2 per cent. ..	"	5.00	..	..	"
" " " " 15 per cent. ..	"	15.00	..	..	"
Horto-Klix ..	"	2.00	..	..	Clark, King and Co. Pty. Ltd., 237 Queen-street, Melbourne
Victory ..	"	2.00	..	..	Victory Dusts, 317 St. Kilda-street, Middle Brighton
Neptune Oil Co. No. 2 ..	"	2.00	..	..	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
Caulicab ..	"	2.00	..	..	Houghton and Byrne Pty. Ltd., 268 Flinders-street, Melbourne
Challenge B ..	"	2.00	..	..	Wright, Stephenson and Co. (Aust.), Pty. Ltd., 34 Queen-street, Melbourne

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).			Wholesale Dealer.
Gammexane Dusting Powders.				
Gammexane No. 4	Gammexane	5		Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
" No. 10	"	1.3		" " " " " " " "
" No. 20	"	2.6		" " " " " " " "
" Smoke Generator	"	3.2		" " " " " " " "
" Plane Gammexane No. 2	"	26		N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
" No. 3	"	30		" " " " " " " "
" No. 4	"	52		" " " " " " " "
Mixed Dusting Powders.				
Plane A.P. No. 50X	Nicotine.	Arsenic Pentoxide (As ₂ O ₅).	Tar Oil.	Sulphur.
" Ramtre No. 9	%	%	%	%
" No. 30	2.00	15.50		
" No. 33	3.00	15.50		
" No. 42	2.00	8.00		
" No. 43	2.00	11.00		
" No. 52	3.00	13.00		
" No. 53	2.00	16.00		
" No. 54	3.00	16.00		
Elephant Duston No. 2	4.00	16.00		
Vallo N.3 A.L.30	1.20	5.00		
Plane Aphidust No. 2	3.00	9.60		
" Ramtre No. 2	2.00		3.00	
" Ramtre No. 45	2.50		4.00	
Neptune Float-On No. 7	2.00			40.00
	2.50	15.50		
Plane Tomato No. 50				
" Azurine No. 20	Arsenic Pentoxide (As ₂ O ₅).	Copper (Cu).	Sulphur.	
" Ramtre No. 21	%	%	%	%
Vallo Tomato and Vegetable No. 1	15.5	4.0		40.0
" No. 2	6.2	7.0		40.0
Tomato No. 2	6.0	30.0		40.0
" " " " " " " "	16.0	6.0		40.0
Plane Azurine No. 2	8.0	5.0		40.0
" " " " " " " "	7.8	5.0		40.0
Plane Azurine No. 4	"	4.0		40.0
" Ramtre No. 13	"	7.0		40.0
Neptune Float-On No. 6	"	11.0		35.0
Azurine	15.5	5.0		25.0
		5.0		40.0
		11.0		35.0
N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne				
Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne				
Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville				
Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne				
N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne				
Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne				
Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne				

	D.D.T.	Nicotine.	Copper (Cu)	Sulphur.	
Plane Nixide No. 100X	% 1-00	% 1-00	% ..	% ..	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
" " No. 100X ₁	1-00	2-00	..	..	" " " " " " " "
" " No. 200X	2-00	1-00	..	..	" " " " " " " "
" " No. 200X ₂	2-00	2-00	..	..	" " " " " " " "
Vallo D.D.T.N. Vegetable	2-00	3-00	..	..	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Plane Azurine No. 100	1-00	..	7-00	40-00	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
" " No. 200	2-00	..	7-00	40-00	" " " " " " " "
" " No. 400	1-00	..	11-00	35-00	" " " " " " " "
Tomato No. 1	2-00	..	8-00	42-00	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne
Pespruf No. 5	2-00	..	7-50	40-00	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Plane Tomato No. 200	2-00	..	4-00	40-00	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
Pespruf No. 3	2-00	..	7-00	..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
" D " Death ..	2-00	..	2-50	..	J. D. Harmsworth and Co. Pty. Ltd., 185 William-street, Melbourne
Challenge E ..	2-00	..	4-00	40-00	Wright Stephenson and Co. (Aust.) Pty. Ltd., 34 Queen-street, Melbourne
Neptune No. 5	2-00	..	5-00	40-00	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
" No. 3	2-00	2-50	..	..	" " " " " " " "
Pespruf No. 2g	% 1-0	% 1-0	% ..	% ..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Killpest No. 1	1-0	1-0	..	..	Victory Dusts, 317 St. Kilda-street, Middle Brighton
Plane Nixide No. 100g ₁	1-0	1-0	..	..	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
" " No. 100g ₂	1-0	1-0	..	..	" " " " " " " "
" " No. 100g ₃	1-0	1-0	..	..	" " " " " " " "
" " No. 200g ₄	2-0	2-0	..	..	" " " " " " " "
Neptune Float-On No. 8	2-0	2-0	..	..	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
Cabbage No. 2	2-0	2-0	..	..	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne
Pestox No. 3 ..	D.D.T. Rotenone Sulphur D.D.T. Pyrethrins	.. .. .. .. ..	% 2-0 0-5 20-0 2-0 1	.. .. .. .. ..	Samuel Taylor Pty. Ltd., 66 Hardware-street, Melbourne
Composite ..	..	..	..	..	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).	Wholesale Dealer.
<i>D.D.T. Solutions.</i>		
Pespruf 20 Emulsion ..	D.D.T. .. 19.5 ..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
" No. 50 Dispersible Powder	" .. 50.0 ..	" " " " " " "
Vermpruf 1A ..	" .. 12.5 ..	" " " " " " "
" 30 ..	" .. 16.0 ..	" " " " " " "
Rucide ..	" .. 50.0 ..	Taubmans Pty. Ltd., 24 Lonsdale-street, Melbourne
Taubman's Ruene ..	" .. 25.0 ..	" " " " " " "
Insecticidal Solution	" .. 4.0 ..	" " " " " " "
Wellspray Emulsion ..	" .. 25.0 ..	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne
Emulsane 20 ..	" .. 20.0 ..	" " " " " " "
Lion ..	" .. 20.0 ..	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Neptune Emulsion ..	" .. 32.0 ..	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
Isco W.S. 10 ..	" .. 10.0 ..	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
Bovox ..	" .. 8.4 ..	Wilcox, Modlin Ltd., 34 King-street, Melbourne
Agro-Kix No. 1 ..	" .. 9.0 ..	Clark, King and Co. Pty. Ltd., 237 Queen-street, Melbourne
" No. 20 ..	" .. 20.0 ..	" " " " " " "
Wellspray 50 ..	" .. 50.0 ..	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne
Neptune Aphidol ..	" .. 4.0 ..	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
Shell Ditrene A ..	" .. 32.0 ..	Shell Co. of Aust. Ltd., 163 William-street, Melbourne
P ..	" .. 4.0 ..	" " " " " " "
Challenge 30% Emulsion ..	" .. 30.0 ..	Wright, Stephenson and Co. (Aust.) Pty. Ltd., 34 Queen-street, Melbourne
40% Dispersible Powder		
Blue Bell Non-Oil Emulsion ..	" .. 40.0 ..	" " " " " " "
Elephant Non-Oil Emulsion ..	" .. 36.0 ..	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Killpest Emulsion ..	" .. 30.0 ..	Jaques Pty. Ltd., 31 Queen-street, Melbourne
" D " Death Emulsion ..	" .. 25.0 ..	Victory Dusts, 317 St. Kilda-street, Middle Brighton
" " " " ..	" .. 20.0 ..	J. D. Harmsworth and Co. Pty. Ltd., 185 William-street, Melbourne
" " " " Death Poultry Spray ..	" .. 2.0 ..	" " " " " " "
" " " " ..	Cresylic Acid 2.0 ..	" " " " " " "
Lane's Destructol ..	D.D.T. .. 5.0 ..	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne
Isobornyl Thioeyano-acetate .. 25.0		
<i>Gammexane Solutions.</i>		
Gammexane No. 15 Emulsion ..	Gammexane 1.95 ..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
" Liquid L.G. 140 ..	" .. 8.7 ..	" " " " " " "
" No. 50 Dispersible Powder ..	" .. 6.4 ..	" " " " " " "
<i>Blowfly Preparations.</i>		
D.D.T. .. %		
Boric Acid ..	.. 5.0 ..	" " " " " " "
Phenol and Homologues ..	.. 22.2 ..	" " " " " " "
Orthodichlorobenzene ..	.. 5.0 ..	" " " " " " "
Hydrocarbon Oil ..	.. 8.0 ..	" " " " " " "
Alkon Blowfly Oil ..	Alkon Pty. Ltd., 36 Clarendon-street, South Melbourne	

Bio-Fli-Di ..	..	Naphthalene ..	7-5	The Nightingale Supply Co. (Vic.) Ltd., Ingles-street, Port Melbourne
		Benzol ..	13-7	
		Sulphur ..	8	
		Tar Oil ..	8-4	
Shell Deafance Blowfly Oil ..		Hydro-carbon Oils ..	84-0	The Shell Co. of Australia Ltd., 163 William-street, Melbourne
		Coal Tar Derivatives ..	13-0	
		Essential Oils ..	3-0	
		D.D.T. ..	5-0	
		Boric Acid ..	5-5	
Immunol Blowfly Dressing ..		Phenol and Homologues ..	22-2	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
		Orthodichlorobenzene ..	5-0	
		Hydro-carbon Oils ..	8-0	
		Eucalyptus Oil ..	33-33	
Way-blo ..		Phenol and Homologues ..	2-77	W. K. Burnside Pty. Ltd., 34-44 Jeffcott-street, Melbourne
Glycerine Di Boric ..		Chlorinated Benzene ..	5-55	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
		Boric Acid ..	21-5	
		Phenols ..	2-5	Osmond and Sons (Aust.) Pty. Ltd., 35 William-street, Melbourne
		Eucalyptus ..	10-0	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Immunol C.B.E. ..		Oil of Camphor ..	13-5	
		Boric Acid ..	8-0	
		Zinc Sulphate ..	1-0	A. H. McDonald, 627-631 Bridge-road, Richmond
Vetamac ..		Tar Oils ..	2-0	
		Essential Oils ..	1-0	
		D.D.T. ..	1-6	
Calarsenite ..		Arsenical Oxide ..	43-0	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
Mago-Tol ..		Cresylic Acid ..	4-0	Goldsbrough, Mort and Co. Ltd., 526 Bourke-street, Melbourne
Mago-Tol, plus D.D.T. ..		Cresylic Acid ..	4-0	
		D.D.T. ..	1-0	
Squatter Blowfly Oil ..		Hydrocarbon Oils ..	84-0	Neptune Oil Co. Pty. Ltd., 532 Bourke-street, Melbourne
		Coal Tar Derivatives ..	13-0	
		Essential Oil ..	3-0	
Benkersol ..		Boric Acid ..	15-0	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
B.H.P. Blowfly Oil ..		Orthodichlorobenzene ..	6-2	B.H.P. By-Products Pty. Ltd., 422 Little Collins-street, Melbourne
		Phenols ..	5-2	
K.F.M. Concentrated D.D.T. Emulsion ..		D.D.T. ..	10-0	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
		Lysol ..	4-8	
		Orthodichlorobenzene ..	15-1	
		Boric Acid ..	15-0	Imperial Chemical Industries of Aust. and N.Z. Ltd., 408 Latrobe-street, Melbourne
I.C.I.-B.K.B. ..		Lysol ..	6-2	
		Orthodichlorobenzene ..	5-2	Graziers' Co-operative Shearing Co. Ltd., 90 William-street, Melbourne
		Boric Acid ..	14-3	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Graziers' Co-op. B.K.B. ..		Tar Acids ..	3-1	
Immunol B.T.B. 15 ..		Orthodichlorobenzene ..	5-2	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
		Boric Acid and Oil ..	14-5	
Wilmoft B.K.B. ..		Boric Acid ..	6-2	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
		Lysol ..	5-2	Atlantic Union Oil Co. Ltd., 396 Collins-street, Melbourne
Immunol B.K.B. ..		Orthodichlorobenzene ..	40-0	
Atlantic ..		Cresol ..	6-7	
		Orthodichlorobenzene ..	14-2	Estee-Arstramax Pty. Ltd., 51 Hardware-street, Melbourne
Blackers ..		Eucalyptus Oil ..	10-0	Goldsbrough, Mort and Co. Ltd., 526 Bourke-street, Melbourne
Harton ..		Cresylic Acid ..	11-3	
		Naphthalene ..	50-0	Taubmans Pty. Ltd., 24 Lonsdale-street, Melbourne
Kleeflox ..		Eucalyptus Residual Oil ..	5-0	
		Phenol and homologues ..	2-5	
		Cresylic Acid ..	4-0	
		Eucalyptus Oil ..	3-0	
		Phenol ..	1-0	
		D.D.T. ..	61-0	
		Mineral Oils ..	80-0	Australian Estates Co. Ltd., 114 William-street, Melbourne
Woollo ..		Neutral Tar Oils ..	5-0	
Sayers D.D.T. ..		D.D.T. ..	2-5	Victorian Producer's Co-op. Co. Ltd., 578-584 Little Flinders-street Melbourne
		Cresylic Acid ..	5-0	
		Tri-iodo-phenol ..	5-0	

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).	Wholesale Dealer.
<i>Weevil Destroyers.</i>		
Vallo Arsenate of Soda (for treatment of hides)	Arsenic Pentoxide (As_2O_5) 63.0 ..	Victor Leggo and Farmers Ltd., 283 Williamstown-road, Yarraville
Vacuum Weevil Oil ..	Pale Mineral Oil .. 82.5 ..	Vacuum Oil Co. Pty. Ltd., 29 Market-street, Melbourne
Shell Weevil Oil ..	Nitrated Phenol .. 85.0 ..	The Shell Co. of Australia Ltd., 163 William-street, Melbourne
<i>Sheep and Cattle Dips (Arsenical).</i>		
Cooper's Powder ..	Conforms with standard (Vic. Dept. of Agric.)	New Zealand Loan and Mercantile Agency Co. Ltd., 538 Collins-street, Melbourne
Little's Powder (Ordinary) ..	" "	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
Quibell's Powder ..	" "	Dalgely and Co. Ltd., 461-471 Bourke-street, Melbourne
Sickle Powder ..	" "	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
Vallo Standard Powder ..	" "	Victor Leggo and Farmers Ltd., 283 Williamstown-road, Yarraville
Lan-o-teen ..	" "	The Graziers' Co-operative Shearing Co. Ltd., 90 William-street, Melbourne
Viper Powder ..	" "	Osmond and Sons (Aust.), Pty. Ltd., 35 William-street, Melbourne
Kleanflok ..	" "	J. H. Rudd and Co. Pty. Ltd., 103-105 William-street, Melbourne
Vetamac ..	" "	A. H. McDonald, 627-631 Bridge-road, Richmond
Kleanfleece ..	" "	J. H. Rudd and Co. Pty. Ltd., 103-105 William-street, Melbourne
Young's Powder ..	" "	Strachan and Co. Ltd., Geelong
Dytic Fluid ..	" "	Dytic Products Pty. Ltd., 4 Roden-street, Melbourne
<i>Miscellaneous Sheep and Cattle Dips.</i>		
Cooper's Quackating Powder ..	Arsenic (As_2O_5) .. 22.00 Rotenone and allied substances .. 70.00	New Zealand Loan and Mercantile Agency Co. Ltd., 538 Collins-street, Melbourne
" Milk Oil Fluid ..	Phenol and Cresol .. 18.00 Arsenic (As_2O_5) .. 24.50	" " " " " " " "
Hart's Immunol Super ..	Cresol .. 33.40 Oleoresin (Derris) .. 82.00	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Kymac ..	Cresols .. 57.00 Rotenone and allied substances .. 33.00	Youngusband Ltd., 94 King-street, Melbourne
Little's Liquid ..	Arsenic (As_2O_5) .. 12.20 Tar Acids .. 13.00	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
" Fluid ..	Tar Acids .. 19.00	" " " " " " " "
Quibell's Liquid ..	" " " " " " " "	Dalgely and Co. Ltd., 461-471 Bourke-street, Melbourne

Vallo Fluid ..	Phenols ..	18-00	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Young's Red Label Paste ..	Arsenic (As ₂ O ₃) ..	24-00	Strachan and Co. Ltd., Geelong
Osmond's Ivory Fluid ..	Inubatoxins ..	15-00	Osmond and Son (Aust.) Ltd., 35 William-street, Melbourne
Sickle Double Action ..	Tar acids ..	19-50	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
Kymac ..	Arsenic (As ₂ O ₃) ..	21-00	Elder, Smith and Co. Ltd., Box 89, Geelong
Quibell's Special Powder ..	Rotenone and allied substances ..	70	Dalgely and Co. Ltd., 461-471 Bourke-street, Melbourne
Little's Supreme Powder ..	Rotenone and allied substances ..	1-33	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
Vallo Dual Purpose ..	Rotenone and allied substances ..	70	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Hart's Immunol Jetol ..	Rotenone and allied substances ..	70	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Hart's Immunol Arsenic Cresol ..	Arsenic (As ₂ O ₃) ..	24-50	" " " " " " " "
Derris Fenol ..	Cresol ..	33-40	" " " " " " " "
Immunol Derris Cresol ..	Alkyl Phenols ..	22-00	The Grazers' Co-operative Shearing Co. Ltd., 90 William-street, Melbourne
Alkon Derris Cresol ..	Chlorinated Benzene ..	10-00	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Udip ..	Pine Oil ..	12-00	Alkon Pty. Ltd., 36 Clarendon-street, South Melbourne
Vacdip Q ..	Derris Oleo-resin ..	2-00	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
Alkon Special ..	Cresol ..	60-00	Vacuum Oil Co. Pty. Ltd., 29 Market-street, Melbourne
Elliott's 35 Liquid Dip ..	Derris Oleo-resin ..	1-50	Alkon Pty. Ltd., 36 Clarendon-street, South Melbourne
" 67 Liquid Dip ..	Arsenic ..	24-50	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
" 94 Powder Dip ..	Arsenic (As ₂ O ₃) ..	33-40	" " " " " " " "
" 128 Liquid Dip ..	Rotenone and allied substances ..	25-00	" " " " " " " "
" 221 Liquid Dip ..	Cresylic Acid ..	1-00	" " " " " " " "
Vetamac No. 3 ..	Cresylic Acid ..	67-00	" " " " " " " "
No. 2 ..	D.D.T. ..	20-00	A. H. McDonald, 627 Bridge-road, Richmond
" " Death Dip ..	Cresylic Acid ..	2-50	" " " " " " " "
Young's Green Label ..	Phenols ..	35-00	J. D. Harmsworth and Co. Pty. Ltd., 185 William-street, Melbourne
Improved Border Paste ..	Coal-Tar Hydrocarbons ..	20-00	Strachan and Co. Ltd., Geelong
Quibell's Gamma ..	Gammexane ..	20-5	Elder, Smith and Co. Ltd., Geelong
Little's Xunex ..	" ..	6-0	Youngusband Ltd., 94 King-street, Melbourne
Sickle Gamalene ..	" ..	6-0	Dalgely and Co. Ltd., 461 Bourke-street, Melbourne
United ..	Arsenic (As ₂ O ₃) ..	40-0	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
Harton Arsenical ..	Cresols ..	12-5	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
" Jetting Fluid ..	Arsenic (As ₂ O ₃) ..	61-0	The Australian Estates Co. Ltd., 114 William-street, Melbourne
		7-2	Goldsbrough, Mort and Co. Ltd., 526 Bourke-street, Melbourne
		70-0	" " " " " " " "

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Note.—Wherever D.T. is mentioned in this list, the percentage shown is in terms of the para para isomer of dichloro-diphenyl-trichloroethane. Similarly Gammaxene is shown in terms of the gamma isomer of benzene hexachloride.

Melbourne, 8th April, 1948.

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OTWAY POTATO PLOT COMPETITION, 1947-48

Report of the Judge, G. H. Mattingley, Potato Expert

The Otway potato plot competition for 1947-48 was won by Messrs. J. Knox and Son of Weeaprounah, with Mr. A. M. J. Murchison of Ferguson and Messrs. E. F. Minchinton and Son of Beech Forest, filling second and third places respectively. The winning entry was of the Sebago variety with Late Carman, which is still the most widely-planted variety in Victoria, filling second and third places.



The winning crop in this year's Otway Potato Crop Competition.

IN the Shire of Otway, where the type of agriculture followed depends so largely upon the cow and the potato, it is natural to expect that these interests are reflected in the social activities of the community. For the past 30 years, the Otway Produce and Agricultural Society has conducted a Potato Plot Competition in conjunction with its Annual Show, which has been notable for the large number of entries received from growers in the district.

During the war years the Society suspended its activities, but, in 1947, organized its first post-war Show and, in the season 1947-48, the Potato Plot Competition was recommenced. Entries were invited from potato growers in the Otway Shire who

had two or more acres under crop, the actual area submitted for judging being one acre in extent. At the closing date 43 entries were received, three of which were subsequently withdrawn.

The Silver Cup competed for in this competition was donated in 1933 by Mr. L. G. Kappe, a former bank manager in Beech Forest who had more than a passing interest in local activities, and one who was a keen advocate of the agricultural possibilities of the district. The Cup must be won three times, though not necessarily in succession, before it becomes the absolute property of any successful competitor. The winner of the competition is presented with a trophy by the Society, and holds the Kappe Cup during the ensuing year.

As the Otway is primarily a seed potato growing district, the judging is done in two stages, namely, at flowering time and at harvest. The competitor with the highest aggregate of points is declared the winner. At flowering time the potato crop is seen at its best, and it is relatively easy to discern "rogues" or foreign varieties and other undesirable or diseased plants. At the same time, the cultivation of the crop is usually completed by flowering time when an assessment can be made of the efficiency of this work and of the general appearance and vigor of the crop.

Method of Judging

The final judging is made when the crop is mature and ready for harvest. Twenty small samples each 1/2240th of an acre in extent are harvested at random from within the area of the plot. An average is struck and converted into tons and cwt. per acre. The produce of the sample rows are graded into two sections:—

- (1) No. 1 grade standard; and
- (2) Below No. 1 grade standard.

An estimate of the yield of marketable tubers per acre is then arrived at by

TABLE 1.—POINTS AWARDED AT FIRST INSPECTION, OTWAY POTATO PLOT COMPETITION.

Name.	Variety.	Freedom from Disease.	Evenness and Vigor.	Varietal Purity.	Cultivation.	Total
Possible Points .. ..	.. ..	30	30	20	20	100
Baulch, R. M. and H. J. ..	Sebago (1)	27	23	18	18	86
	Sebago (2)	27	25	20	18	90
Beveridge, C. S.	Sebago	22	25	20	16	83
Brown, D. and C.	Sebago	25	26	12	17	80
	Up-to-Date	26	23	20	17	86
Butler, J.	Sebago	25	25	18	17	85
	Up-to-Date	25	23	20	17	85
Deppeler Bros.	Sebago	26	24	18	16	84
Dow, R. and W.	Sebago	25	25	20	17	87
	Up-to-Date	25	25	20	17	87
Francis, J.	Late Carman	27	26	18	18	89
Gardner, R.	Sebago	23	24	20	17	84
Grosse, H. G.	Sebago	26	24	20	17	87
Hobson, J.	Sebago	28	25	18	20	91
	Late Carman	28	26	14	18	86
Knox, J., and Son	Sebago	28	27	19	20	94
	Sequoia	28	27	20	20	95
	Kathadin	28	25	20	19	92
Minchinton Bros.	Sebago (1)	26	25	20	17	88
	Sebago (2)	28	27	18	19	92
Minchinton, E. A.	Sebago (1)	27	24	17	18	86
	Sebago (2)	27	22	16	18	83
	Up-to-Date (1)	27	24	20	20	91
	Up-to-Date (2)	28	22	20	18	88
Minchinton, E. F., and Son ..	Up-to-Date (1)	26	25	18	15	84
	Up-to-Date (2)	28	26	20	15	89
	Up-to-Date (3)	26	25	20	16	87
	Late Carman	26	27	20	18	91
Murchison, A. M. J.	Sebago	26	18	18	18	80
	Late Carman	28	27	14	18	87
	Up-to-Date	25	20	20	18	83
McCann, S.	Sebago	26	25	13	17	81
McKenzie, A.	Sebago	27	24	20	16	87
	Katahdin	26	25	20	17	88
Skinner, F.	Sebago	27	22	18	15	82
	Late Carman	25	24	20	15	84
Tann, W. H.	Up-to-Date	26	25	18	20	89
	Sebago	24	23	14	18	79
Towers, A. J.	Late Carman (1)	26	27	16	18	87
	Late Carman (2)	24	26	20	19	89
Westbury, V. R.	Sebago	26	24	16	14	80



A general view of potato-growing country near Weeaprounah, in the centre of the Otway District.

adding the total weight of tubers of No. 1 grade standard to *half* the weight of tubers below that standard. The competitor having the highest estimated yield per acre is given top marks for yield and the others are calculated on a pro rata basis. Average samples of tubers are taken from each crop and, when the field judging is completed, they are all assembled and given points for type, texture, whiteness of flesh, and freedom from internal defects.

The first inspection of the crops was made during the week commencing February 16th, and details of the points awarded are set out in Table 1. Despite the dry weather being experienced in the rest of the State, the Otway potato crops appeared most promising. To the writer, who has been intimately associated with the Seed Potato Certification Scheme since its inception, the condition of the crops in respect to freedom from disease and foreign varieties was particularly gratifying.

The final inspection and assessment of yields was carried out in the week preceding the Otway Produce and Agricultural Society's Annual Show, held on Saturday, 15th May. Because of the large number of entries, entailing a considerable amount of work in assessing the yield of each crop, and partly because of the inclement Otway winter weather, the Society agreed that the twelve leading crops in the preliminary judging only should be harvested. Some

of these, however, were withdrawn for various reasons and others lower down the list were substituted in their place.

THE WINNING CROP

The winning crop was grown by Messrs. J. Knox and Son, of Weeaprounah, who entered an excellent plot of the Sebago variety. Careful attention had obviously been paid to the selection of seed as the stand was uniform and practically free from misses or diseased plants. Planting had been done with precision, and subsequent cultivation was all that could be desired. The sample harvested from this crop was somewhat large with some irregular off-type tubers. Points were lost on this account, but not sufficient to take from Messrs. Knox and Son a well-deserved win.

This is the second occasion on which these growers have been successful, and, as a result, next season's competition promises to be keen, as three of the leading growers in the district have now each won the competition twice.

An interesting feature of the competition was the non-competitive entry of the Sequoia variety, grown by Messrs. J. Knox and Son, in co-operation with the Department of Agriculture. This entry gained the highest number of points in both the preliminary and final judgments which indicates that the variety may have interesting possibilities in Victoria. The

produce of the area being grown this season is being distributed by the Department of Agriculture to established certified seed growers for further multiplication, and it can be expected that stocks of Sequoia

will be available for general distribution within a short time.

Details of the points allotted in the final judging and the awards made are given in Table 2.

TABLE 2.—POINTS AWARDED AT FINAL INSPECTION, IN ORDER OF MERIT.

Name and Address.	Variety.	Rows per Chain.	Estimated Yield of Marketable Tubers.	Points for Weight.	Size, Type, and General Appearance.	Texture.	Whiteness of Flesh.	Freedom from Defects.	Total.	Score at First Inspection.	Grand Total.
Possible Points ..	..	..	tons, cwt.	40	20	20	10	10	100	100	200
J. Knox and Son, Weeaprolnah	Sebago ..	28	13 16	38.3	16	18	9	6	87.3	94	181.3
A. M. J. Murchison, Ferguson	Late Carman	28½	14 7	40.0	14	16	9	10	89.0	87	176.0
E. F. Minchinton and Son, Beech Forest	Late Carman	26	10 9	29.1	15	18	10	10	82.1	91	173.1
E. A. Minchinton, Weeaprolnah	Up-to-Date (1)	26½	12 15	35.5	15	14	7	10	81.5	91	172.5
R. M. and H. J. Baulch, Stalker	Sebago (2) ..	28	10 4	28.4	17	17	10	10	82.4	90	172.4
J. Hobson, Lavers Hill	Sebago ..	29	10 5	28.6	16	17	8	9	78.6	91	169.6
Minchinton Bros., Ferguson	Sebago (2) ..	26½	9 8	26.2	16	17	8	10	77.2	92	169.2
A. McKenzie, Wyelangta	Katahdin ..	32	11 8	31.8	18	17	9	5	80.8	88	168.8
E. A. Minchinton, Weeaprolnah	Sebago (1) ..	30	11 4	31.2	15	18	9	9	82.2	86	168.2
R. and W. Dow, Ferguson	Sebago ..	30	10 11	29.4	17	15	8	9	78.4	87	165.4
J. Francis, Ferguson ..	Late Carman	25	8 10	23.7	10	18	9	10	70.7	89	159.7
*J. Knox and Son, Weeaprolnah	Sequoia ..	28½	12 16	35.7	18	17	9	10	89.7	95	184.7

* Non-competitive entry.

CONTROL OF RED MITE ON POULTRY

Trials with DDT

By D. McQueen, B.V.Sc., Veterinary Officer

IN last month's issue of this Journal, a trial was described in which a proprietary form of DDT watery suspension was used as spray for the treatment of red-mite infestation in poultry pens, and a comparison was made between these treatments and the effect of tar oil when used for the same purpose.

It was possible to examine these pens twelve weeks after the last examination in the original trial, and, following this examination, observations were made:—

Pen No. 1

0.1 per cent. DDT applied twenty weeks previously. A fairly heavy infestation with engorged mites was found at most of the perch junctions.

Pen No. 2

1.5 per cent. DDT applied sixteen weeks previously. No mites were found at the perch junctions.

Pen No. 3

0.5 per cent. DDT applied twenty weeks previously. No mites were found at the perch junctions.

Pen No. 4

Tar oil applied sixteen weeks previously. A heavy infestation of engorged mites was found at most of the perch junctions.

Pen No. 5

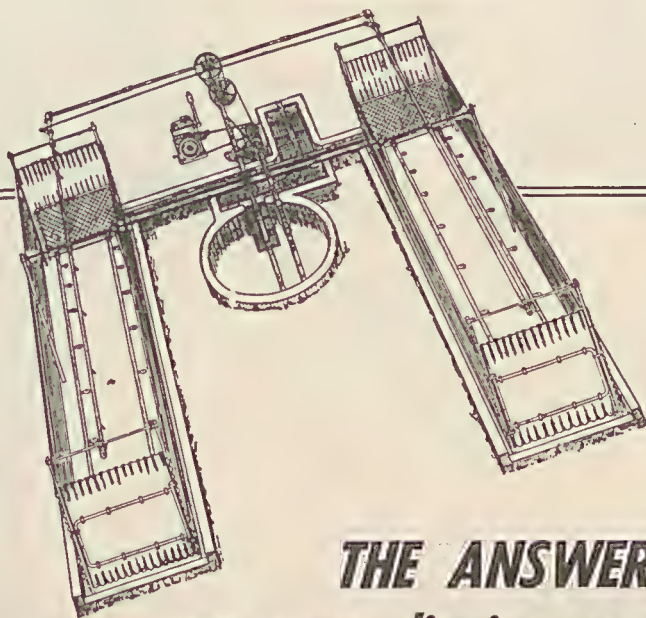
1 per cent. DDT applied twenty weeks previously. No mites were found at the perch junctions.

From these results it is considered that the conclusions of the original trial have been substantiated, namely:—

(1) That 0.1 per cent. DDT suspension was too weak for use in infested poultry pens.

(2) That DDT suspensions of 0.5 per cent. and over, exerted a better residual effect against red mite than tar oil.

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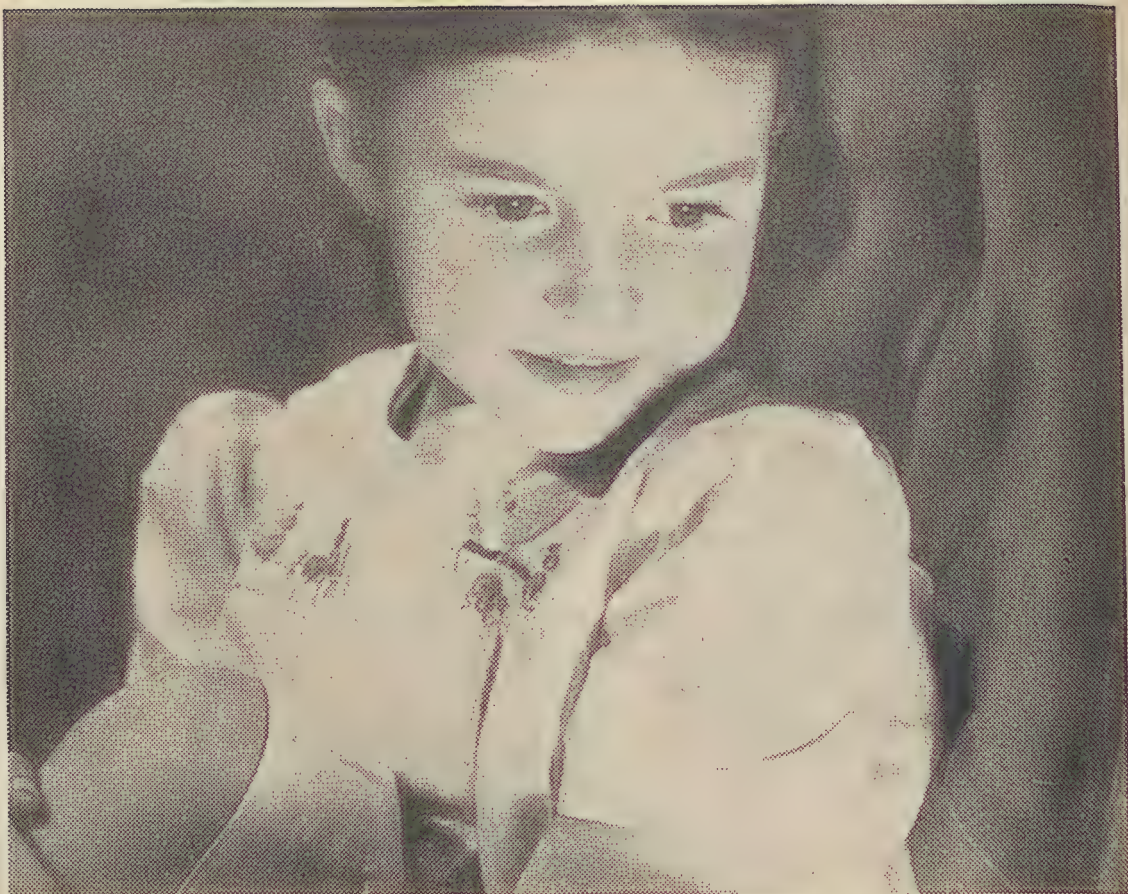
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Vine Trellising and Pruning in Irrigated Areas

By D. G. Quinn, Viticulturist

The vine in its wild state is a climbing creeper which, each autumn, completes its cycle of growth by maturing seed enclosed in a coat of sweet pulp to assure the maintenance and spread of the species. As this pulp develops a much higher percentage of sugar than other berries and fruits native to temperate climates, the vine has been highly valued by man since the dawn of history.

Under cultivation, the size of the plant is controlled by varying the number of plants per acre, and a system of training is necessary to permit cultural operations as well as to enable the vine to support the normal foliage induced by given soil conditions and curbed by a normal crop. Pruning is performed to maintain a balance between the crop and the growth of foliage. For example, if a vine is left unpruned an unduly heavy crop is set, foliage growth is stunted by competition, and insufficient leaves are developed to bring the current crop and the future fruiting canes to maturity. Conversely, if a vine is drastically overpruned, an abnormal amount of foliage is produced and the setting of the fruit may be influenced unfavourably. Within the range of excessively light or heavy pruning the balance between foliage and crop is adjusted by the natural ability of the plant to vary the size and sweetness of the individual berry, and sound pruners erring on one side or the other within the range do not alter the final yield in weight of sugar developed beyond 10 per cent. of the optimum.

Standard systems of planting, training, and pruning have consequently evolved through the ages to meet the requirements of the different varieties when grown mainly under natural rainfall conditions.

These systems are fully described in publications available from various State Departments of Agriculture, namely: "Handbook of Viticulture" (Victoria), Bulletin No. 396; "Vineyard Establishment" (South Australia), Bulletin 140; "Pruning of the Vine" (New South Wales).

This article is prepared to illustrate further developments rendered necessary to counter the increased growth and crop potentiality of vines grown in arid climates entirely dependent on irrigation and to meet the inherent peculiarities of the varieties popular in these areas.

This process of evolution stands to the credit of observant growers, for the systems now universally used were in most cases unknown in the early days of irrigation in Australia, and it is probable that finality has not been reached in this matter yet.

THE SULTANA

THE sultana was originally trained on the Bordelais espalier system, which carries the spur and rod unit on either side of a low vertical stem, and the Sylvos system, which carries a series of depressed rods along the permanent horizontal arm. The Bordelais system was abandoned because the spur growths grew too vigorously and were blown out by the wind, and other suitable renewal wood only developed at the extremities of the rods. The permanent arm of the Sylvos system was also abandoned because it developed bare spaces, but the fruiting unit of the Sylvos system, namely, the depressed rod which causes the production of strong renewal wood from the base of

the rod, has been retained in all systems of sultana pruning. The aim is to draw these rods from as close as possible to the crown of the vine. In all systems of trellising great care should be given to the establishment of a vertical and straight stem, as this, rather than the trellis posts, supports the weight of the crop.

Figs. 1-3 illustrate the three main systems of sultana pruning. Fig. 1 shows the rods carried on one wire. This idea is adopted for vines of moderate vigor, or where it has been found that the lower wire has been set in too near ground level, and, if used, favours mould development. Fig. 3 illustrates what is generally referred to as the standard system. It is reputed to produce about 10 per cent. more



Fig. 1.—Sultanas trained on single wire. Left, Prior to pruning. Right, after cutting out. Lower, after wrapping down.

fruit compared with vines of similar vigour trained on the previous style. The fruit, being spread on two wires, is less subject to mould and more canes can be laid down effectively. Usually trellis posts 6 feet long 4 ft. 4 in. out of the ground are placed between every third vine, and the wires are spaced from the ground 2 ft. 3 in.—3 ft. 2 in.—4 ft. 3½ in. Fig. 3 (right) illustrates the sultana T trellis, which has been adopted widely of recent years. It consists of two wires spaced 9 inches apart on the same level and as high as the 6-ft. standard post will permit, viz., 4 feet from the ground.

The wires are attached to the post as described. A hole is bored through the top of the post at right angles to the trellis wires. A piece of fencing wire 2 feet long is then shaped as a "U" and passed through the hole. If the post is not 9 inches wide wooden spacing washers are added to obtain the width. These are made from 3-in. x 2-in. hardwood sawn into 3-in. lengths and bored in the centre. Trellis wires are then run through the eye on one side and the twined ends on the other. No foliage wire is necessary. There are many points in favour of this form of trellis for vigorous vines, the chief of which is that the fruiting wood is all disposed on the same level and equally exposed to sunlight. The fruit is less liable to mould

and sunburn and is more easily harvested. Tests have shown an increase in yield of about 10 per cent. over the standard trellis (1).

This is not an entirely new system of training. It has been tried and remained unpopular over the past 50 years using wooden

cross-pieces 18 inches wide and set too low. This interfered with cultivation and necessitated topping and rolling on.

The evolution of the narrow T, set up at 4 feet, eliminates the faults noted in the past.

FRUIT-BEARING WOOD OF THE VINE

The pruner distinguishes between two types of annual cane found on the vine. Any canes springing from the remnant of a cane of the year previous is classed as fruiting wood, whereas canes that have sprouted from buds which have laid dormant one or more years, or base-bud growths, are termed watershoots and are normally avoided as of doubtful value for the production of fruit-bearing shoots. Watershoots are usually pale and brittle, the nodes are spaced widely, and the buds are usually underdeveloped and barren. A cane arising from the remnant of a watershoot, however, is classed as fruiting wood

for pruning purposes. Because of their value in reshaping vines watershoots are often utilized.

If an annual cane is examined it appears to carry one bud at each node. However, clustered around the base of the main bud are secondary buds, not visible to the naked eye, which burst if the main bud is damaged, but otherwise remain dormant unless forced into growth as watershoots by abnormal circumstances.

In the case of most varieties every main bud on a fruiting cane is capable of giving rise to herbaceous shoots which will carry normal-sized bunches, but, in the case of the sultana, the first three or four main buds produce herbaceous shoots which do not normally carry fruit, and, as a consequence, grow more strongly than the fifth to fourteenth buds, which do produce fruitful herbaceous shoots. This brings out two facts, firstly, that the sultana must be rod pruned, and, secondly, that spurs are unnecessary to assure the production of well-situated and



Fig. 2.—Sultana vine; 13 canes left last year, resulting in lack of suitable canes for laying down this year.

strongly-grown canes to replace the rods of the current season.

NUMBER OF RODS PER VINE

Experimentally, the highest yield per vine is obtained from unpruned vines; the fruit, however, is of very low quality, characterized by small, loosely-set bunches, small fruit ripening very late and lacking in sugar. The foliage is represented by an

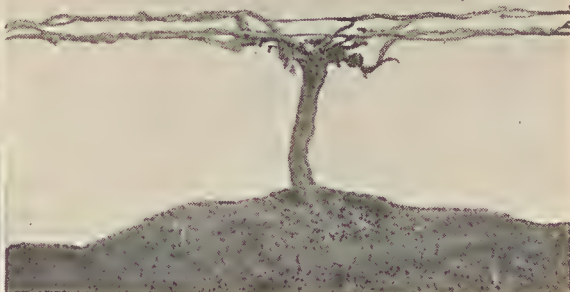


Fig. 3.—Sultanas trained on two wires. The upper picture shows a young vine of ideal shape. Left, Old vine showing tendency of crown to increase in height. Right, Sultana on T trellis.



Fig. 4.—Renovation of an old crown by training up a sucker.

abundant bushy growth of very small shoots. Pruning is practised to improve the quality of the fruit, and this object is attained by reducing the crop and consequently stimulating foliage growth. The aim should be to produce sufficient growth to mature the maximum crop of suitably-sized bunches and berries. If the ratio of foliage to fruit is on the high side the maximum will not be reached; if too low, the quality of the crop will suffer in the immediate season, and suitable rods carrying fruitful buds will be in short supply for the succeeding season. The number of rods left at pruning time should be related to the apparent vigor of the vines. Lyon and Walters (1) have shown that, with vines of moderate vigor, five rods depressed yields, but seven canes gave no significant increase over six. In a similar replicated experiment conducted over six seasons on more vigorous vines, twelve canes averaged 3 per cent. more fruit than ten, and ten 3 per cent. more than eight, the total difference being not significant.

As the crop potential is not greatly increased by the addition of one or two rods above the essential the practical pruner adopts a liberal policy for the following reasons:—A watershoot or rod of doubtful

origin is often selected in rapid cutting out, occasional breakages occur when wrapping down, and finally, if too few rods are left, although the crop may not be reduced appreciably, the bunches are apt to be over large and dense, which feature gives rise to sun-drying problems. For vines of average vigor the pruner aims at about eight rods, each fourteen or fifteen buds in length.

In replacing the number of rods each year pruners often have to follow out some of the old rods a fair distance to obtain renewal wood. The length of two-year-old wood so retained is termed a shank. Where rods are wrapped down on two levels, the shank type should always be carried down sharply to the lower wire to encourage the bursting of watershoots near where the shank joins the vine crown, and where replacement wood is desired. If such shoots are well placed but small, one eye should be left rather than exterminate the growing point. If such growths are strong and well placed one may be wrapped down as a short rod of five to seven buds with a view to supplying well-placed fruiting rods in the following year to permit the elimination of accumulated shanks.

RENOVATION OF CROWNS

The crown of the vine always rises with age and the vigor of growth falls off as the sap channels become restricted by pruning injuries. As one odd vine here and there becomes affected in this manner watershoots usually spring from beneath the restriction and these should be utilized to reform the crown as illustrated in Fig. 4. On the other hand, where the whole block is suffering from age, layering midway between each two vines is advocated.

In both cases the old crown is retained for several years.

WRAPPING DOWN RODS

Throughout the life of the vine the wrapping down of the rods has a definite bearing on the cropping and the maintenance of the shape of the vine.

Usually, skilled pruners go ahead selecting the canes for rods and cutting out the unwanted growth. They are followed by learners who pull off the unwanted growth and wrap down the rods. It is sometimes

recommended that the pruners should leave an extra rod to be used in cases of breakage but this is impracticable as usually a different man wraps down everything allowed to remain as a rod by the pruner.

All the canes on one wire are wrapped round in one direction to facilitate pulling off in the following year and in such a manner that one rod does not cover the buds on another.

The rods are twisted tightly so that cracking may be heard but they are not fractured. The first definite twist occurs in the neighbourhood of the sixth bud. This slight restriction encourages the buds to burst. If the rods are not firmly twisted, excessively strong growth occurs at the rod ends at the expense of the intervening growths.

Where the rods are trained on two wires, those carrying long shanks and the extra-strong long-noded canes are selected for depressing to the lower wire.

THE OHANEZ

The Ohanez is very subject to Black Spot and shy cropping. The good soils of the Victorian irrigated areas suit it admirably when the variety is appropriately trained. It has mainly been trained similarly to the Sultana, in which case it produces coarse wood and little crop (Fig. 5, upper left). Some Ohanez have been trained on the narrow sultana T trellis about 5 feet above the ground (Fig. 3, right). This largely eliminates sunburn and does appear to improve the crop. All Ohanez in Spain are trained on the full overhead trellis (Fig. 5, lower left), and about ten years ago the Department erected 8-ft. high, 5-ft. wide T trellises in various districts for demonstrational purposes (Fig. 5, upper right). The yields have been regular and to the order of ten tons per acre. This height was selected with a view to pruning and harvesting from the platform of a trolley or a stool. Fig. 5 (lower right) shows vines being trained to a 6-ft. high, wide-T trellis by an owner of



Fig. 5. —Upper left, Ohanez on Sultana-type trellis. Upper right, high T demonstration trellis erected by Department at Tresco. Crosspieces 5 ft. wide, 8 ft. high. Lower left, Full overhead trellis. Lower right, early stages in conversion to 6-ft. high, wide-T trellis.

an 8-ft. high, 5-ft. wide-T trellis. He claims this is cheaper, does not interfere with cultivation, and can be worked from the ground.

While the system of pruning illustrated in Fig. 5 (upper right and lower left) is giving satisfactory results, it differs from the Spanish system in that several of these long rods would be converted to permanent arms, furnished with many short rods of about 1 foot in length. The benefits of the overhead system are many; the foliage shades the ground and reduces evaporation; the passage of air beneath the foliage largely eliminates fungus and mould problems and the effects of light frosts; the grapes set colour and ripen better; the skin toughens and the fruit keeps longer; sunburn is eliminated; the foliage is more efficiently exposed to sunlight; and the canes change in nature from long-noded coarse shoots to short-noded, short, fruitful shoots. In Spain, by the time the trellis rots, the stems of the vines practically support the framework.



Fig. 6.—Waltham Cross, looking down on crown to show spread of secondary arms.

The high cost of overhead trellising is of small consequence where Ohanez grow into large vines and bear well. However, there are many blocks of Ohanez appearing healthy but setting badly, and a few panels of overhead trellising should be tried to observe results. Salty soils or soils not easily watered should not be chosen for this temperamental variety.

THE ZANTE CURRANT

The Zante Currant is represented by an area only second to the Sultana in the irrigated areas but is losing favour because the dense crops are very easily ruined by light January rains and the fruit never develops the desired blue-black colour of currants produced in cooler districts. Better colour and size could be induced by more care in training and pruning, but rapid ripening in a hot district militates against the maximum development of colouring pigments.

To make the crop set well it is essential to cincture the main stem of this vine when two-thirds of the corollas or caps have fallen from the flowers. The vine then proves a very reliable bearer when spur pruned. Because of the small size of the currant bunch the vine must be given a large framework and the spurs set a little closer than in the case of large-bunch varieties. The spurs should be encouraged to grow outwards on either side of the area to resemble the bone structure of a fish, and so permit two lines of fruit to hang clear of the central arm. Spurs can be encouraged to grow outwards by pruning to a bud pointing outwards when originally selecting a cane for a spur.

The original spurs eventually develop into side arms which should be maintained between a range of 3 to 6 inches in length. The spurs of all spur-pruned varieties are usually pruned to two buds, and many find difficulty in discerning the first bud to be taken into account. This should be the first bud definitely on last year's cane, even though it is only separated by the thickness of a fingernail from the older wood from which the cane has grown.

Too many spurs give rise to small bunches of small, poorly-coloured, late-ripening fruit, which are, perhaps, more resistant to rain damage. The currant is frequently trained with a top and bottom set of arms,

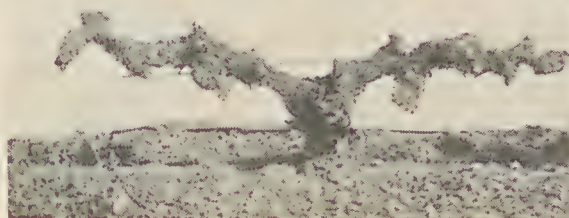
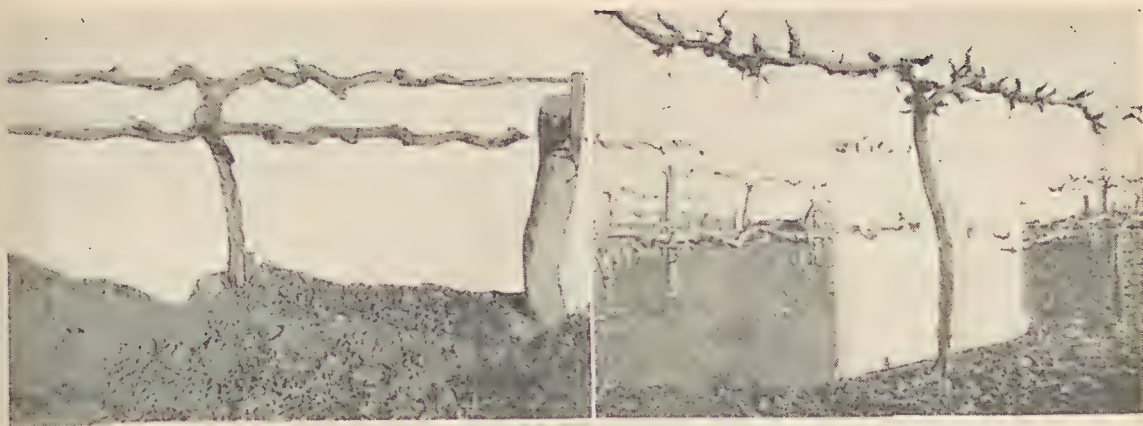


Fig. 7.—Left, Waltham Cross on T trellis. Right, Zante currant vines trained on two levels. Lower, Muscat Gordo Blanco, spurs pruned to one bud.

but, after a few years, the top set robs the lower set of normal sap supply. The idea, as illustrated in Fig. 7 (right), of training alternate vines on different levels is certainly an improvement, but even so, the lower vines gradually weaken as the top layer of foliage absorbs the greatest proportion of sunlight. Small areas of currants are trained on a 4 or 5-ft. T trellis, slightly wider than that described for the sultana and somewhat similar to that shown in Fig. 7 (left). The cordon system of training for all spur-pruned varieties, for good reasons, has been gradually abandoned.

THE WALTHAM CROSS

The Waltham Cross vine is usually trained as a spur-pruned Thomery espalier at a height of 3 feet. The aim should be to open out or spread the framework as illustrated in Fig. 6 so that the fruit is carried well out from the vine. A similar result is obtained by the use of a wide T trellis as shown in Fig. 7 (left). There is a tendency to increase the height of trellising to 3 feet 6 inches to prevent the foliage trailing on the ground. The spurs of this variety are often pruned to one bud for high-quality table or drying fruit. Tests have shown the yield increases slightly up to three-bud spurs. When rods are included the yield increases 50 per cent. but the fruit is valueless for the above-mentioned purposes.

The variety is grown with great success on the full overhead trellis at Cobram. Alternatively, in many situations the vine has a tendency to grow vigorously and not set any crop. Such areas might be rod-

pruned for disposal to wineries until the vines steady down into a regular-bearing habit. The Waltham Cross, picked at or above 15° Baumé, has frequently obtained first prize in the Melbourne Wine Show, whereas, at lower sugar strengths, it is only suitable for distilling material. With lighter late-summer watering, this crop would not waste easily from rain during the over-ripening period.

MUSCAT GORDO BLANCO

Muscat Gordo Blanco is a very regular, heavy-bearing variety, trained and pruned somewhat similarly to the Waltham Cross. As the annual shoots are short, a single-wire trellis set about 2 feet above the ground, and with posts between every four vines, gives satisfaction.

Fig. 7 (lower), shows a vine, pruned to one bud, in a block which has continuously produced about ten tons per acre of table fruit.

Disbudding a fortnight before flowering has a favorable influence on setting.

The Doadillo and Grenache are trained similarly to the Gordo but on a trellis wire set 30 to 36 inches above ground.

SUMMER PRUNING

Summer pruning is not generally recommended. Sultana rods should never be topped under 3 feet 6 inches in length, and the balance of the fruiting canes seldom grow very strongly. However, what is known as a "runaway" cane can be topped with advantage.

The same recommendation applies to all other varieties. Disbudding, or the removal of unwanted shoots soon after sprouting, is recommended for the currant and particularly for the Gordo. Bunch thinning three weeks before or three weeks after flowering is an important form of summer pruning in the production of table fruit.

PRUNING AFTER FROSTS

This should always be done. In the case of rod-pruned varieties, such as the Sultana and Shiraz, pruning causes the sprouting of dormant main buds on the rods which will carry some fruit, but its chief purpose is to give rise to strong pruning canes for the following year. For example, take a herbaceous cane of 2 feet in length frosted back 12 inches. If allowed to remain, three or four spindly laterals will appear. If the same cane is pruned back to within $\frac{1}{2}$ inch of its sprouting point and

some disbudding done three weeks later, vines treated in both ways will again be in full foliage in six weeks, but those drastically pruned after frost will be found to have well-situated and stronger individual shoots for use in the following pruning. In the case of a late frost perhaps the best and cheapest treatment for the Sultana is to cut all the rods back to a length of 6 or 8 inches, and prune any herbaceous shoots remaining as the possibilities of any commercial return are negligible.

Owing to the vine not carrying a crop after a frost, the canes arising from base or secondary buds can be counted on as fruitful at the following winter pruning.

In the case of spur-pruned varieties such as the Currant, Waltham, and more particularly the Gordo and Grenache, the second crop set after repriming will often approach a full crop, no faulty setting will be noted, and with vines reprimed in early November, the crop will mature one month later than normal.

This treatment of repriming is also applicable to vines suffering from a very severe early infection of Black Spot.

REFERENCE.

(1) Lyon, A. V. and Walters, D. V.—"Production of Dried Grapes in Murray Valley Irrigation Settlements". (Council Scientific and Industrial Research) Bulletin No. 143.

HANDLING POULTRY

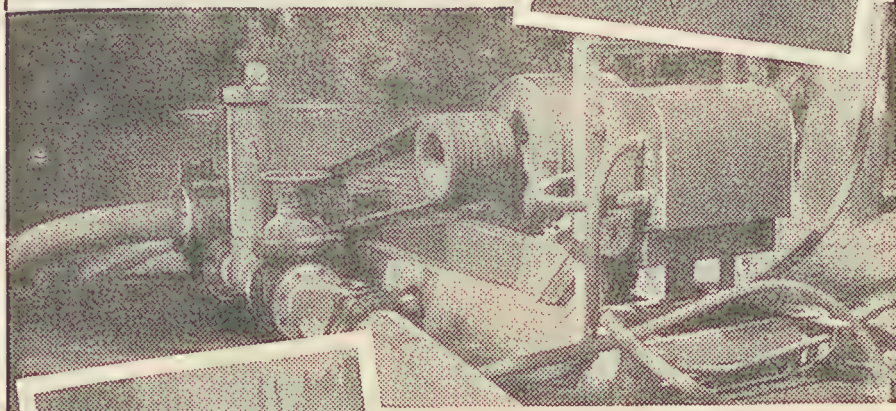
When fowls are to be caught the work should be carried out in the laying house by placing a wooden framework covered with wire-netting, approximately 6 feet high, across one corner of the house. Carefully drive the birds behind this partition where a helper, located behind the framework, may catch the birds quietly. An opening in the framework, about 3 feet from the ground and extending to the top, will enable the operator to pass the birds through. A bag nailed at the top and allowed to hang down over the opening will prevent the birds from escaping.

When crating for market make sure that there is sufficient room in the crate. If overcrowded, the birds may become injured or die in transit. When the distance to market is great, give the birds food and water just before they are despatched. For turkeys, place some straw in the crate to avoid damage to the breasts, and put the different sexes in separate crates. If a small lot is placed in one crate, the males and females are best separated with a division. Various sizes and kinds of poultry should always be separated.

The practice of dropping crates of poultry heavily on the ground during loading or unloading operations, or handling poultry roughly as they are being moved in or out of transport crates is most detrimental to the birds, apart altogether from humanitarian considerations.

[Contributed by the Live Stock Division.]

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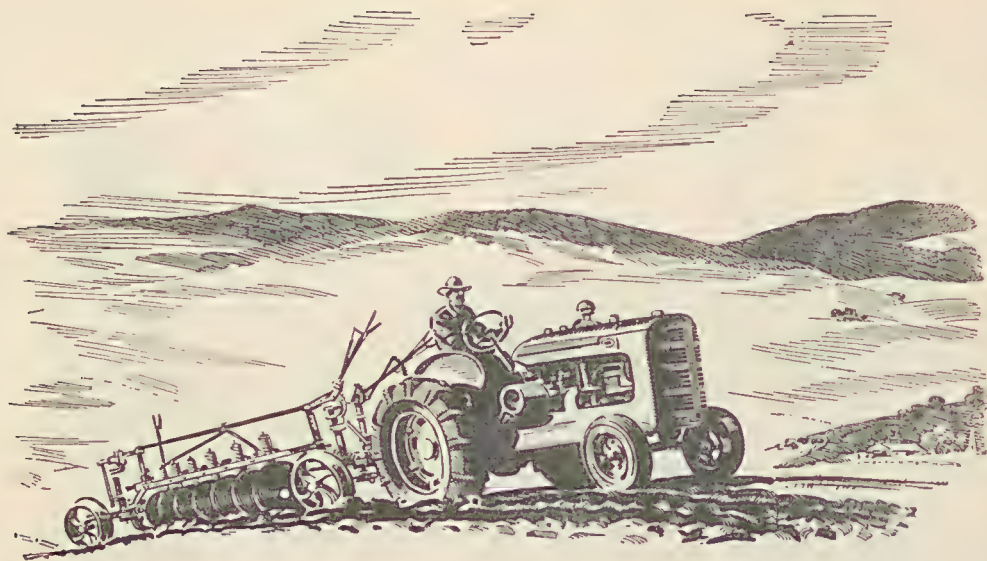
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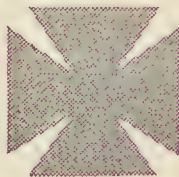
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Vegetable Seed Certification and Approval Schemes

LIST OF GROWERS FOR 1947-48 SEASON

By R. F. HENDERSON, B.Agr.Sc., Horticultural Research Officer

CERTIFIED FRENCH BEAN SEED

APPENDED is a list of growers whose French bean seed crops, grown in isolated areas in East Gippsland, have been passed for certification. These crops have conformed to the standards required by the Seeds Act and the standard of disease freedom required by the regulations of the certification scheme. Of 31 crops for which certification was sought, only five reached the required standard, disease incidence being particularly widespread in the 1947-48 season.

The regulations require that crops must be rogued for other varieties and must not contain more than 5 per cent. of plants showing Bean Mosaic disease after the first inspection. During inspection these crops must not show evidence of Halo Blight (*Pseudomonas medicaginis* var. *phaseolicola*), American Blight (*Xanthomonas phaseoli*) or Anthracnose (*Colletotrichum lindemuthianum*) and must be reasonably free from other diseases.

Realizing the devastating effect these diseases can produce, East Gippsland growers have willingly co-operated in the extension of bean seed certification, with the result that healthier crops with much improved yields of both green beans and seed beans are being produced. Only certified seed and seed recommended by the Department was sown in 1947-48 season in this district, the main bean-growing area of Victoria.

For the coming season, a larger quantity of approximately 700 bushels of certified Brown Beauty, all of which will be sown in East Gippsland, is available to supply an increasing demand. It is the Department's aim to assist growers to eventually build up sufficient stocks of certified seed of all commonly-grown

varieties, so that the bean-seed industry might be restored to the level of prosperity it enjoyed before the years of halo blight ravages.

GROWERS OF CERTIFIED BEAN SEED FOR 1947-48 SEASON.

Grower.	Address.	Acreage.
BROWN BEAUTY.		
Hurley Bros. ..	Dargo	9
Peisley, A. B. ..	Genoa	10
Phelan and Websdale	Dargo	8
Thurlby, H. ..	Dargo	3
Walker, W. H. ..	Gipsy Point ..	12

APPROVED PEA SEED

During the pre-war years, the majority of garden pea-seed crops were sown primarily with a view to picking green peas for market, and, in the event of unpayable prices, crops were harvested as seed propositions. This practice is still common where transport to Melbourne is economical, but, in the further Western District, many growers are concentrating on the production of approved pea seed.

Listed below are growers whose pea-seed crops have conformed to the standards of purity and disease freedom set down for the scheme. These crops sown with approved mother seed of long satisfactory history have reached a very high degree of purity. During several field inspections, no trace of Bacterial Blight (*Pseudomonas pisi*) or Septoria Blight (*Septoria pisi*) was detected in these crops, and they are reasonably free of Ascochyta Blight (*Myosphaerella pinoides*, *Ascochyta pisi*, and *Ascochyta pinodella*). Seed from

these crops sealed and labelled with an identifying tag is in large demand, by growers buying through co-operative packing houses, and is competing very favourably with the best imported seed.

Approved Greenfeast seed is being sown both for canning peas and green peas for market, and is giving very satisfactory results in many districts. The bulk of the seed was purchased soon after harvest when cleaning had been completed, and only a small quantity from late crops remains to be sold.

A considerable quantity of this season's harvest has been retained for seed production and it is hoped that sufficient seed will be available in the coming season to meet the increasing demand for approved pea seed.

GROWERS OF APPROVED PEA SEED FOR 1947-48 SEASON.

Grower.	Address.	Acreage.
GREENFEAST.		
Callahan, F. ..	Barwon Downs ..	6
Hutchinson, W. A., and Sons ..	Drysdale ..	5
Lane, J. J. ..	Killarney ..	6
Noske, P. J. ..	Moutajup ..	8
O'Brien, B. ..	Yambuk ..	14
Sharrock, R. J. ..	Bessiebelle ..	3
Sheehan, W. H. ..	Killarney ..	4
Taylor, J. and K. ..	Barwon Downs ..	9
Thomas Bros. ..	Bessiebelle ..	20
Uebergang, A. T. ..	Yambuk ..	4
Willis, A. ..	Rosebrook ..	3
Wills, J. C. ..	Malmsbury ..	14

APPROVED TOMATO SEED

As the bulk of Victoria's tomato-seed requirements is grown locally, the Department has introduced an Approval Scheme to ensure the production of reliable true-to-type seed, so that our growers, processors, and consumers can obtain uniform, good-quality tomatoes.

The approved crops listed hereunder have been rogued for plants that do not conform to the type described for each variety. After a number of inspections during the growing period, no evidence of Bacterial Canker (*Phytophthora michiganensis*) was found, and the crops are reported to be reasonably free from all other diseases. As a control measure against Bacterial Canker, seed intended for sowing is hot-water treated and growers wishing to grow approved tomato seed must submit their seed to this Department for treatment before sowing.

This season applications for approval were received for the main Goulburn Valley-Bendigo varieties, and, in the coming season, it is hoped to approve seed of the more important southern Victorian varieties.

GROWERS OF APPROVED TOMATO SEED FOR 1947-48 SEASON.

Grower.	Address.	Acreage.
BURWOOD WONDER.		
Van Staveren, J. ..	Shepparton East ..	2
TATINTER.		
McKenzie, D. and D. J.	Marong, via Bendigo	$\frac{1}{2}$
Van Staveren, J. ..	Shepparton East ..	1 $\frac{1}{2}$
VICTORIAN DWARF.		
McKenzie, D. and D. J.	Marong, via Bendigo	$\frac{1}{2}$
Van Staveren, J. ..	Shepparton East ..	1 $\frac{1}{2}$

Information regarding regulations and conditions of these schemes may be obtained on application to the Director of Agriculture, Department of Agriculture, Melbourne, C.2. Purchases are made direct from the growers, and the Department does not sell any of this seed.

NOTE.—Growers of certified onion seed were listed in the June issue of the Journal.



Quality Characteristics of the Victorian Wheat Crop

By E. J. O'BRIEN, A.A.C.I., Cereal Chemist

SEASON 1947-48

During intake of wheat to grain elevators throughout Victoria, regular weekly samples were taken and forwarded to the Departmental laboratory for examination. Resulting from the analysis of 761 such samples, a detailed report was made to the Grain Elevators Board.

The information obtained from the analysis of these samples, supplemented by baking trials and special tests on composite samples, is the basis on which this report is made. The report is, to some extent, an amplification of a preliminary report issued as a guide to the trade in January, and confirms the predictions made on the basis of early samples.

The object of this report is to make available the results of the many analyses involved, to comment upon quality trends, and to indicate the wheat quality for this season.

REVIEW OF 1947-48 SEASON

Climatic conditions in the main wheat-growing areas of the State have been reviewed in detail by officers of the Department of Agriculture in reports published in the April issue of this Journal on wheat crop competitions for 1947.

Early seasonal conditions were generally satisfactory throughout the wheat belt, with good opening rains in autumn. This promising start was followed by a dry spell which, in many cases, delayed seeding. The normal winter rains, from June to August, were satisfactory and conditions at this stage were excellent, with high yields being forecast. However, the moist, warm conditions, although favourable to the growing crops, were also favourable to the development of rust and other fungous diseases. Rust ruined many crops, and seriously reduced the yield in others, but sections of the wheat belt escaped with only minor damage.

The favourable climatic conditions early in the season laid the foundations of a record harvest, and, although rust caused a reduction in yield below the anticipated level, and caused a lowering of the bushel weight, the yield for the season was considerably above average. It is usual for

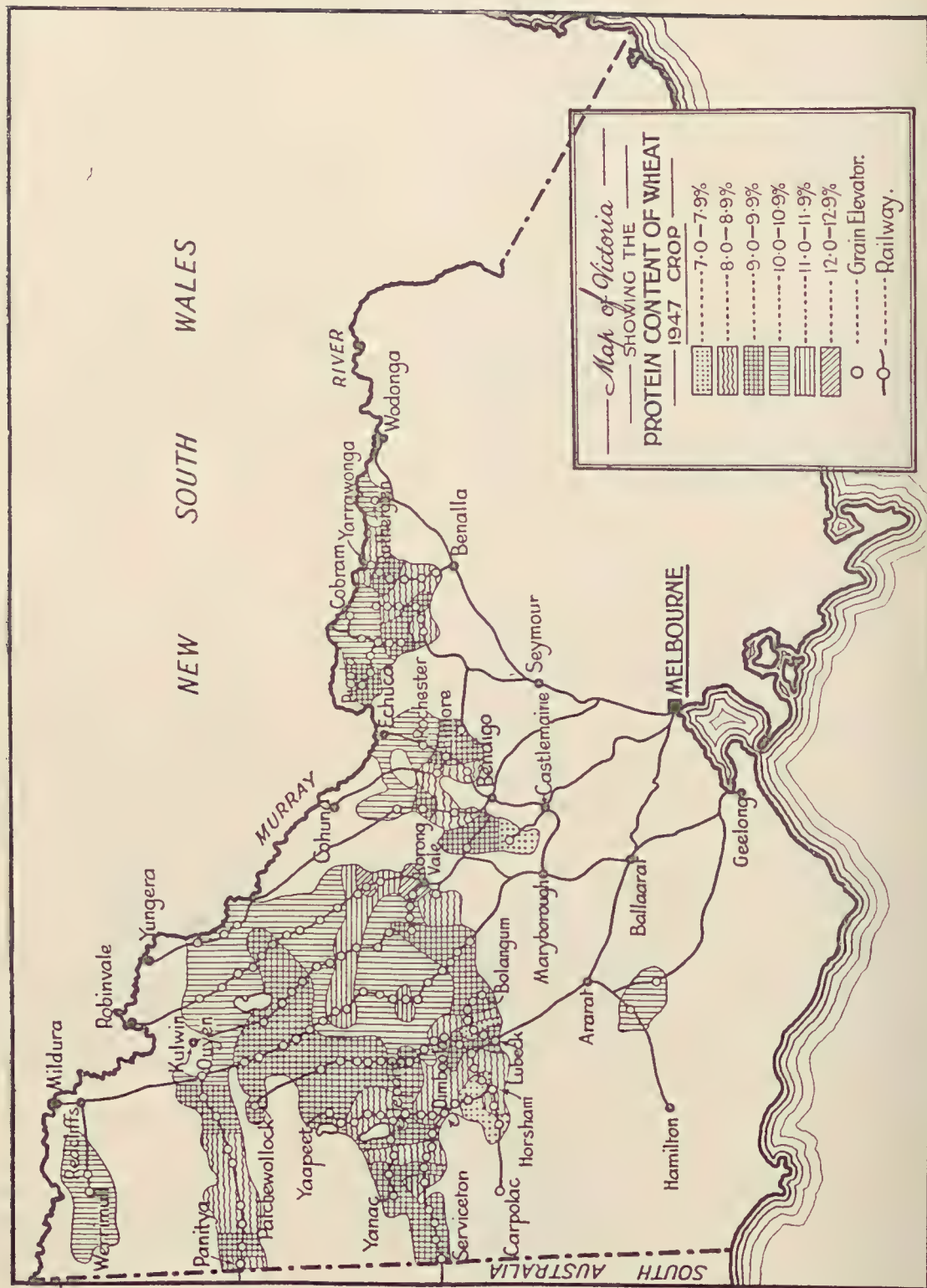
protein content and yield to be related, and this is found to be the case this year where we have low protein associated with high yield.

TABLE 1.—WHEAT PRODUCTION
IN VICTORIA.
(Grain Only.)

Year.	Area.	Production.	Yield.
	Acres.	Bushels.	Bus./ac.
1938-39 ..	2,748,362	18,104,369	6.6
1940-41 ..	2,672,728	13,521,422	5.1
1941-42 ..	2,757,080	46,953,840	17.0
1942-43 ..	2,145,156	41,803,107	19.5
1943-44 ..	1,793,428	19,733,322	11.0
1944-45 ..	2,141,729	3,497,677	1.6
1945-46 ..	3,251,393	29,633,760	9.1
1946-47 ..	3,501,135	48,970,908	14.0
1947-48 ..	* 3,250,000	47,000,000	14.5
Average for 10 years ending 1939 ..	2,988,795	40,380,602	13.5
Average for 8 years ending 1948 ..	2,689,081	31,389,254	11.6

* Estimate only.

Seasonal yield variation for Victorian wheat harvests is shown in Table 1; area and total grain production are also shown for preceding years, together with appropriate averages.



WHEAT VARIETIES IN VICTORIA

Tables 2 and 3 show the percentage sowings of the more important wheat varieties of Victoria in comparison with similar information for previous years.

Quadrat, Magnet, and Bencubbin are still expanding in acreage sown, at the expense of the older varieties, Ghurka and Rancee 4H. However, it will be noted that two recently-released varieties, Pinnacle and Insignia, have now come into the top ten varieties. While these are of better quality than those they replace, the expanding acreage of Quadrat and Magnet tends to weaken Victorian flour quality.

This year, Diadem—a variety of very good baking quality—is recommended for trial sowing, and it is hoped that the influence of this and other recent releases will considerably improve the baking quality of Victorian wheat.

PROTEIN MAP

The protein map has been constructed from the results of testing weekly samples from each grain elevator in the State. The samples represented 30 million bushels. From the weekly samples, weighted mean values were determined, and these were plotted on the map to show a general picture of the protein distribution throughout the State.

TABLE 2.—WHEAT VARIETIES SOWN IN VICTORIA.

(Percentage of Total Wheat Area.)

Variety.	1947-48.	1946-47.	1945-46.	1941-42.	1940-41.
Quadrat ..	37.2	26.9	19.9	0.3	..
Ghurka ..	12.8	20.3	25.7	52.7	47.6
Magnet ..	12.0	9.1	6.4	1.5	0.4
Bencubbin ..	9.2	8.4	6.0	5.1	5.3
Pindar ..	9.1	9.8	7.6	0.1	..
Rancee 4H ..	6.4	8.8	6.9	18.2	20.2
Regalia ..	4.0	4.8	4.1	2.5	1.9
Insignia ..	1.9	..	..	..	..
Pinnacle ..	1.3	..	..	..	..
Bobin ..	1.2	1.4	1.1	1.9	2.1
Mixed Seed..	..	4.1	18.9*	..	..
All others ..	4.9	6.4	3.4	17.7	22.5

* Includes wheat from silos and stacks used as source of seed owing to 1944 drought and also less popular varieties.

TABLE 3.—PERCENTAGE OF FIVE LEADING WHEAT VARIETIES IN DISTRICTS.

Variety.	Mallee.	Wimmera.	Northern.
Quadrat ..	24.4	56.4	37.6
Ghurka ..	12.1	12.5	15.0
Magnet ..	2.0	16.6	19.6
Bencubbin ..	18.0	2.0	3.7
Pindar ..	17.0	3.0	3.5

The entire State shows a lowering of the protein content for this year as the result of seasonal conditions, but the relative distribution is similar to that of preceding years. The Southern Wimmera is very low, whereas the Southern Mallee and Eastern Wimmera are relatively high. The northern Mallee and north-eastern districts are irregular with adjacent areas of high and low protein content.

The results over the past few years have suggested that certain areas tend towards high protein while others tend towards low; testing early samples to determine the general protein level will therefore allow reasonably accurate predictions regarding the quality of wheat in the State to be made very early in the season.

The presence of low and high-protein areas, indicated by this method of testing Victorian wheat quality, has prompted a research programme to determine the reason for the variation and to seek treatments to raise the protein level of the Wimmera and possibly of the whole State. The objective is ambitious, and there are so many complicating economic factors that some years will elapse before the experimental results can be interpreted.

PROTEIN DISTRIBUTION

Figure 1 shows the frequency diagram for the 761 samples examined for protein content, and further information relating to seasonal trends is shown in Table 4. This season the range of protein content throughout all weekly samples was 7.2 to 13 per cent. This range is the extreme variation but, within each elevator, there is a variation due to wheat being grown

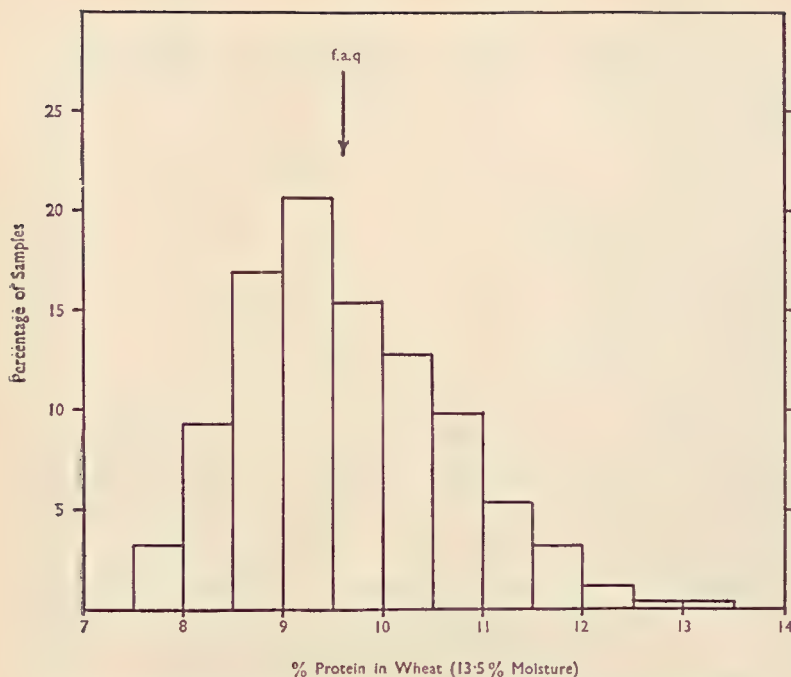


Fig. 1—Frequency diagram showing percentage of samples falling within each 0.5 per cent. protein range.

under different conditions. The average variation between the highest and lowest results for each elevator is 1.2 per cent. While this figure gives a guide to the expected variation, it is possible that deliveries from an elevator will comprise wheat from one or two growers and might therefore be outside the average range calculated. This limitation on the applicability of this figure must therefore be recognized in considering single deliveries from an elevator.

Figure 2 is similar to Figure 1 except that it represents the first week's deliveries to elevators; it was on this basis that a preliminary report on Victorian wheat quality was made in January. The fact that the distribution is similar and the

average almost identical, confirms the reliability of making predictions on this basis. Coupled with the known relationship between districts this information, which can be made available very early in the season, should be used to isolate wheat of differing quality in bulk depots and to advise bakers and millers of the flour quality to be expected later in the season. The preliminary report system was introduced last year with this object in mind, and now that its reliability has been checked over two seasons it is hoped that in future years full use will be made of this advance information.

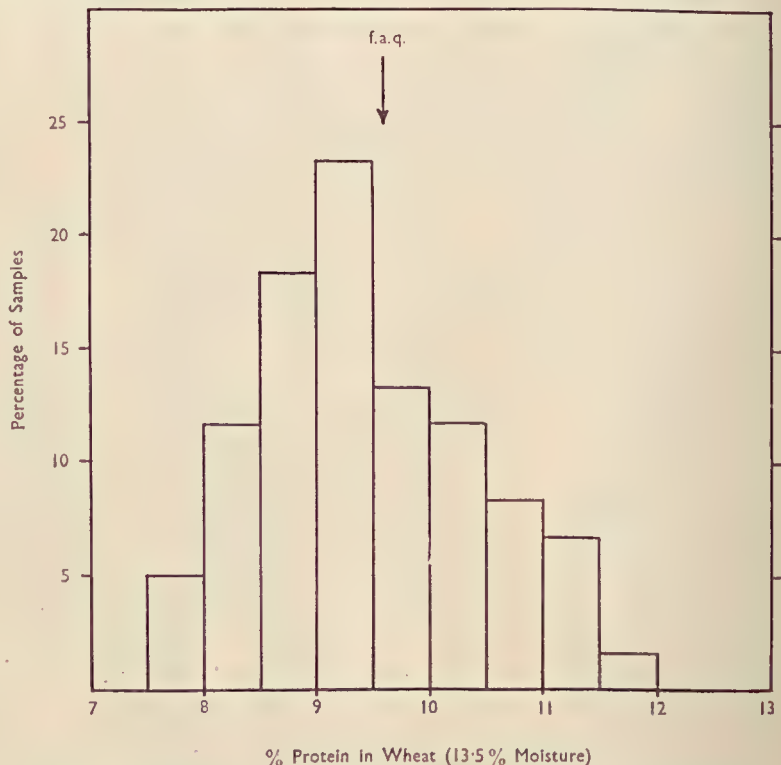


Fig. 2—Frequency diagram showing percentages of first week's samples falling within each 0.5 per cent. protein range.

TABLE 4.—SEASONAL PROTEIN VARIATION.
(Calculated on 13.5 per cent. Moisture Basis.)

Year.	1942-43.	1943-44.	1945-46.	1946-47.	1947-48.
Number of elevators sampled	117	136	137	139	143
Protein content (average)	10.6	10.2	11.7	11.2	9.5
Protein content (variation)	8.8-13.7	7.9-12.3	9.9-13.2	8.7-15.0	6.9-14.9
Protein content (range)	4.9	4.4	3.3	4.3	8.0
Protein content (f.a.q. sample)	10.9	10.1	11.6	10.9	9.6

GROUPING OF ELEVATORS ACCORDING TO PROTEIN CONTENT

Tables 5, 6, 7 and 8 list the elevators of the State according to their district and protein content. At the foot of each column the proportion of the district and State each column represents is shown. This information is again depicted in Figure 3 where the proportion of the crop above or below a pre-determined protein content can be seen at a glance. It is generally recognized that the minimum quantity of protein in the wheat from which a baker's flour is to be produced should be 9 per cent. Figure 3 shows that 28 per cent. of the wheat received at elevators or approximately 9 million bushels is below this minimum.

TABLE 5.—WIMMERA ELEVATORS.
Protein Content.

7.0-7.9%	8.0-8.9%	9.0-9.9%	10.0-10.9%	11.0-11.9%
Natimuk Pimpino Dooen Rupanyup	Burrum Murtoa Minyip Nullan Jung Horsham Vectis Wall Dimboola Kiata Salisbury Tarran- glinnie Arkona Antwerp Jeparit Lorquon Ellam	Bolangum Marnoo Banyena Jackson Lubeck Coromby Warrack- nabeal Batchica Brim Tarranyurk Detpa Netherby Yanac Gerang Gerung Nhill Miram Kaniva Lillimur Serviceton Swanwater Charlton Sutherland	Lah Sheephills Morton Plains Watchem Litchfield Donald Cope Cope Wycheproof Glenloth Willaura Westmere	Massey
District % 7.1 ..	32.0	35.2	24.2	1.5
State % 3.1 ..	13.0	15.4	10.7	0.6

TABLE 6.—MALLEE ELEVATORS.
Protein Content.

8.0-8.9%	9.0-9.9%	10.0-10.9%	11.0-11.9%	12.0-12.9%
Pullut Rainbow Underbool Linga Cowangie Murrayville Panitya	Albacutya Yaapect Galaquil Beulah Rosebery Hopetoun Patche- wollock Woome- lang Lascelles Gama Speed Tempy Galah Walpeup Carina Berri- willock Boigbeat Sealake Nyarrin Ultima Gowan- ford Mananga- tang	Birchip Watchupga Ouyen Karawinna Werrimull Warne Culgoa Quamba- took Cannie Lalbert Meatlan Waitehie Chillin- gollah Chinkapook Pira Nyah West Piangil	Kinnabulla Curyo Dumosa Nullawil Gredgwin	Barraport
District % 10.9 ..	50.8	28.1	8.4	1.8
State % 3.9 ..	18.0	10.0	3.0	0.6

It might perhaps be contended that protein quality is more important than quantity; this contention is sound provided there is sufficient protein present for changes in quality to be noticeable, but for average Victorian wheat composed of all the varieties sown bread quality is directly proportional to protein content. Figure 4 shows the results from all the baking results in Table 9, plotted against their respective flour protein contents. The correlation between the measurement of protein quantity and the ultimate bread quality is very good and confirms the reliance placed on protein determinations.

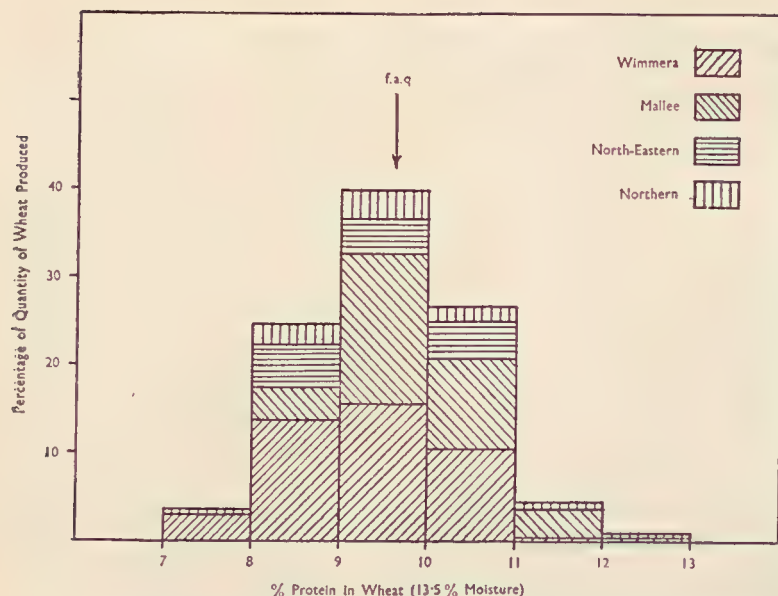


Fig. 3—Frequency diagram showing percentage of total wheat produced falling within each 1 per cent. protein range.

BAKING AND ANALYTICAL RESULTS

Table 9 shows the analytical figures obtained from composite samples each representing a particular protein range within a district as listed in the previous tables. The flour samples were obtained by milling on an experimental roller mill to give a flour yield comparable to that obtained in commercial practice. All the flours are very low in diastatic activity and consequently in gassing power, indicating the necessity for malt flour additions to achieve satisfactory yeast action in the doughs and subsequent aeration of the bread.

Figure 5 shows the Farinograms for four samples from Wimmera and the Mallee.

The Farinograph is an instrument which measures the mixing characteristics of a flour and produces a diagram called a "Farinogram", which, by its shape, enables an experienced operator to assess some of the factors responsible for bread quality. The machine actually measures the work done in mixing a flour-water dough to a standard consistency level, represented by

the horizontal line on the chart. Sufficient water is added to give this consistency, and this water absorption is closely related to the water absorption of a flour in a bakery. The first part of the curve, going upwards to the standard consistency line is very important, as it represents the speed of hydration of the flour and is associated with potential strength; generally, the longer this time the greater the strength. The length of time, measured horizontally, where the curve maintains its consistency without weakening, is regarded as a measure of the mixing tolerance of the flour, while the slope of the curve as

it falls away is an indication of its tolerance during fermentation. Comparison of the farinograms in Figure 5 shows a progressive increase in the measureable curve characteristics with increasing protein content; furthermore, the curves for the Mallee

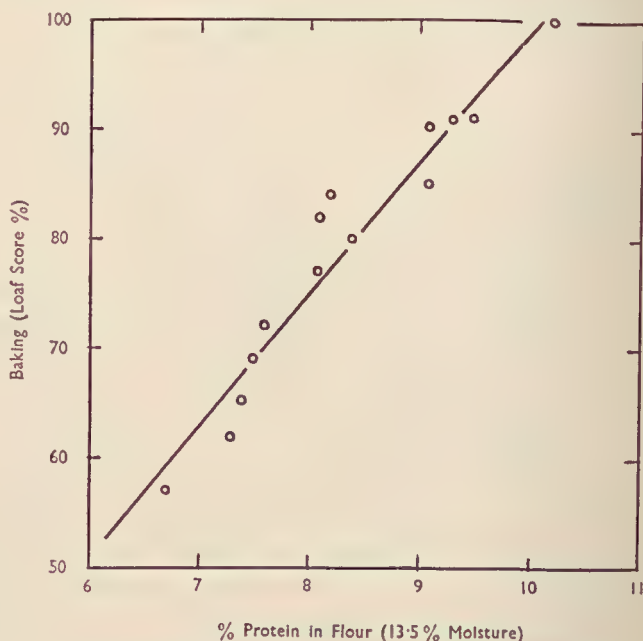


Fig. 4—Relationship between baking score and flour protein percentage.

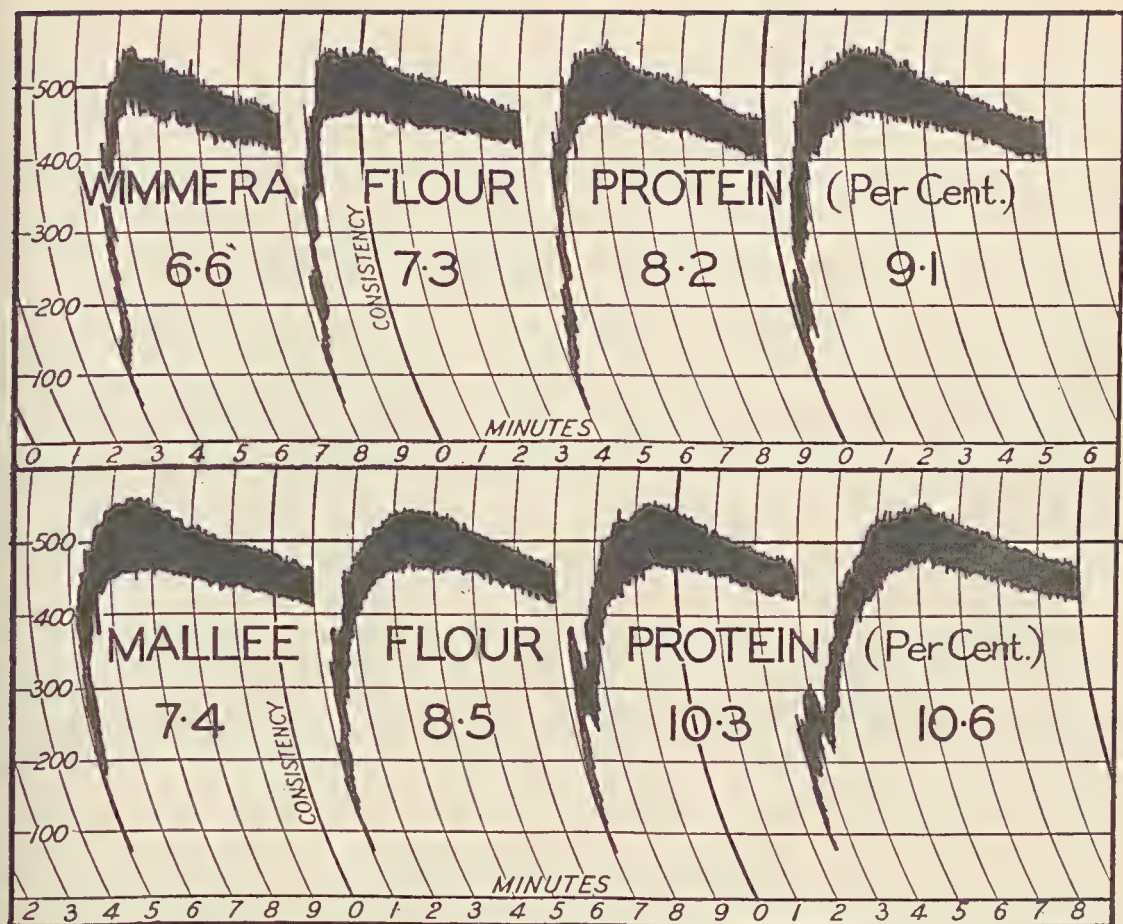


Fig. 5—Typical farinograms for 1948.

are better than those of the Wimmera, and this is in conformity with the baking results.

examined. It does show a small rise with increasing protein content but the influence of variety is not marked.

TABLE 7.—NORTHERN ELEVATORS.
Protein Content.

7.0- 7.9%	8.0- 8.9%	9.0- 9.9%	10.0- 10.9%	11.0- 11.9%	12.0- 12.9%
Shel- bourne	Wedder- burn Ray- wood Goor- nong Hunter	Bridge- water Tan- darra Colbin- abbin	Barrakee Buckra- banyule Mitlamo Roches- ter	Boort	Wychi- tella
District % 4.0 State % 0.4	27.3 2.0	33.5 2.5	10.0 1.4	9.7 0.7	5.6 0.4

The Pelshenke figure, although useful for cereal variety tests, does not yield any useful information on the composite samples

TABLE 8.—NORTH-EASTERN
ELEVATORS.
Protein Content.

8.0-8.9%	9.0-9.9%	10.0-10.9%
Pine Lodge Cosgrove Yabba North Youanmite Goorambat Devenish St. James Yarrawonga	Telford Tungamah Tallygaroopna Wunghnu Nathalia Picola Dookie	Waaia Numurkah Katunga Cobran Katamatite Rutherglen
District % 37.2 State % 4.0	30.5 4.0	32.3 4.3

Baking tests were made in the usual standard manner, as indicated in the table, and the volume and loaf scores are shown in relation to the other analytical results.

The score represents an objective evaluation of relative volume, crust, crumb, and tolerance and is a better criterion of baking quality than volume alone.

By comparison with samples of comparable protein content in last year's report, there is very little change in intrinsic quality, but it must not be overlooked that most of this year's crop is of lower protein content. For instance, whereas last year a flour protein of 8 per cent. represented the lower end of the Wimmera range, this year it occupies the midpoint of the scale. Consequently the baking quality of this season's flour—taken as a whole—is lower than for the previous year. Surprisingly good bread can be made from this season's low protein flour, but the wheat must be properly conditioned and milled and doughs carefully handled.

To make good commercial bread this year is a challenge to the skill of the baker. He must use less water in his doughs, mix carefully, and accurately gauge his fermentation time to obtain the optimum quality in his bread.

SUMMARY

The protein content of Victorian wheat, determined on representative samples from grain elevators, is considered in relation to the quantity of wheat produced and the main wheat-growing areas.

The protein content of this season's wheat is relatively low, and, consequently, the baking quality is correspondingly lowered.

Approximately 28 per cent., or 9 million bushels, of the wheat received at grain elevators has insufficient protein for the manufacture of satisfactory bread flour. This wheat should be segregated and most should be utilized for purposes in which low protein is not a disadvantage, while the balance could be blended with wheat of higher protein content, to yield a satisfactory flour.

Acknowledgment

Acknowledgment is made to officers of the Grain Elevators Board who forwarded samples throughout the harvest, to Mr. G. Duncan who conducted most of the protein analyses and assisted in their interpretation, and to the Grain Elevators Board for permission to publish the information contained in this report.

TABLE 9.—ANALYTICAL RESULTS.

District	Wimmera.				Mallee.				Northern.			North-eastern.		
Wheat protein (range) per cent. ..	7.0- 7.9.	8.0- 8.9.	9.0- 9.9.	10.0- 10.9.	8.0- 8.9.	9.0- 9.9.	10.0- 10.9.	11.0- 11.9.	8.0- 8.9.	9.0- 9.9.	10.0- 10.9.	8.0- 8.9.	9.0- 9.9.	10.0- 10.9.
Wheat protein, per cent. ..	7.7	8.4	9.5	10.4	8.7	9.3	10.5	11.3	8.6	9.4	10.6	8.5	9.3	10.5
Pelshenke figure, mins. ..	32	37	39	37	35	42	39	43	36	41	37	40	37	42
Flour protein, per cent. ..	6.6	7.3	8.2	9.1	7.6	8.1	9.3	10.2	7.4	8.4	9.5	7.5	8.1	9.1
Wet gluten, per cent. ..	19.5	22.8	27.5	32.5	23.0	26.5	31.5	34.2	24.5	24.0	29.5	21.5	27.5	28.5
Dry gluten, per cent. ..	6.5	7.9	9.1	10.6	7.4	8.5	10.3	10.6	8.0	8.2	9.8	7.5	9.1	9.6
Water absorption (Farinograph) per cent. ..	53.0	52.8	52.4	54.6	53.6	56.0	56.0	57.6	52.8	53.4	55.3	51.4	52.0	54.4
Valorimeter number (Farinograph)	40	38	40	40	40	44	40	44	36	32	30	44	40	38
Maltose figure (mgms. maltose per 10 grms.) ..	76	76	71	65	80	76	76	65	71	71	65	76	65	65
Loaf volume c.cs.—														
Malt, phosphate procedure ..	460	455	480	510	490	500	510	525	450	485	490	485	485	505
Malt, phosphate, bromate procedure ..	465	475	520	545	500	520	555	580	505	515	545	495	515	525
Loaf score per cent. (best loaf = 100) ..	57	62	84	90	72	81	91	100	65	80	91	69	77	85

Contagious Abortion (Brucellosis) of Dairy Cattle

By B. H. RUSHFORD, B.V.Sc., Veterinary Officer

CONTAGIOUS abortion of cattle, also known as brucellosis, is a widespread and destructive disease caused by the germ *Brucella abortus*. Incidence of the trouble in Victoria, and indeed throughout the world, is high, and the disease causes losses amounting to many thousands of pounds annually. It is also a serious danger to human health due to germs passing out with the milk of infected cows, and causing the disease known as undulant fever in human beings.

With the introduction of preventive vaccination of calves by the Department of Agriculture, it is hoped to lessen the ravages of this disease. However, while vaccination is proving its value, there are other steps which should be used in conjunction, and dairymen are advised to make themselves familiar with the nature and methods of the spread of the disease so that they may apply effective control measures.

SPREAD OF THE DISEASE

The trouble is most commonly spread by the contamination of the pasture by an infected animal at calving. The animal contaminating the pasture need not necessarily abort; she may carry her calf the full term, yet still shed the germs when she calves. The aborted foetus, or the normal calf, the membranes from the cow, or any discharge from the uterus of the infected dam may carry the germs in thousands to the pasture. Other animals pick up the infection by grazing over this pasture, or by eating or licking the membranes or the foetus or calf. Further, infected material may pass in drainage from one pasture to another, or other animals may carry this material about, thus spreading the contamination.

Experiments have shown that cattle can be infected through the mucous membranes or lining of the eye. Flies or other insects, therefore, may play a part in spreading the disease.

The importance of the bull in the spread of the disease is usually over-estimated, but any sire showing a swelling of the testicles (which may be an indication that he is infected) should be discarded, not only because he is liable to spread the disease, but also because his fertility would almost certainly be diminished.

When a susceptible cow becomes infected in any of the above ways, the germs are carried in the blood stream to lodge eventually in some organ of the body, usually the udder from which they may be excreted in the milk. When this animal becomes pregnant, her breeding bag or uterus provides a suitable site in which the germs may multiply. In the uterus an inflammation is set up in the outer layer of membranes round the foetus, the blood supply to the foetus is interfered with, and abortion occurs. This animal will almost certainly remain a carrier for life and, in many cases, will spread the disease at each subsequent calving, although the calvings themselves may be quite normal (the animal never aborting again). Some cattle abort twice or even more often, but, in general, they abort once only.

SYMPTOMS

The main symptom of the disease is the act of abortion which usually, though not always, occurs fairly late in pregnancy. Here, however, discernment must be exercised, as not all abortions are due to brucellosis, and further, as stated previously, an infected animal does not necessarily abort. Quite often, the abortion or even the normal calving in an infected animal is followed by retention of the after-birth

which may have serious effects; an inflammation of the uterus may be set up and this often tends to become chronic, with a discharge from the genital tract resulting in failure of the animal to breed normally thereafter.

Infected bulls may show no symptoms or may suffer from an enlargement of the testicles, with abscesses gradually destroying the normal tissue. One other point to remember is that germs tend to lodge in the joints of affected animals, and swellings in joints of cows, particularly of the knees, should be viewed with suspicion.

If an owner of a cow wishes to know if she is infected he may have the blood tested. Secure the blood by making a nick about half-way down the tail with a sterilized knife, and catch the blood in a clean, sterile bottle with a close-fitting cork. Forward to the Director, Veterinary Research Institute, Parkville, with a covering letter or telegram.

TREATMENT USELESS

Once an animal has become infected there is no treatment for the disease. The administration of patent medicines to cows to overcome abortion is a waste of money, and dairyfarmers should realize that a cow, once she has aborted, will not usually abort again, and that quite often some treatment or other gains a reputation it does not deserve. The fact that some particular cow does not abort again after treatment is the result of the natural course the disease takes and not of any treatment she may receive.

CONTROL OF THE DISEASE

Blood Testing

In the control of brucellosis there are two methods which may be adopted. The first, the test and slaughter method, is based upon the fact previously mentioned, that an animal infected with *Brucella abortus* germs can usually be detected by a laboratory examination of her blood.

A farmer wishing to completely eradicate the disease can have all his animals blood tested and the reactors slaughtered. At least two tests, 30 days apart, would be necessary, after which testing every six months would probably suffice. It is obvious, however, that such a method of

control involves considerable difficulties. Firstly, there is the economic loss involved in the disposal of reactors; secondly, the methods of spread, as outlined earlier, represent a constant danger to any herd, and, in this connexion, too, it should be remembered that a herd free of the infection is a very susceptible herd, and that any infection introduced is liable to have serious results. The necessity for blood testing, the danger attendant on introducing any animal into the herd, and the fact that the blood test is not 100 per cent. accurate, are all complications in control by this method.

"Strain 19" Vaccination

The second scheme is that of calfhood vaccination with "Strain 19" vaccine. This is a live but weakened strain of *Brucella abortus* which, when used on calves, preferably between four and eight months of age, confers a degree of immunity. Many thousands of calves have been vaccinated by Departmental officers, and the results have been exceedingly satisfactory. In fact, the demand for vaccination became so great that, with the limited staff available, the Department introduced a system whereby neighbouring farmers took their calves to one centre where vaccination was carried out. The time saved by the use of this system is great, and enables officers to immunize many more calves than is possible if visits to individual farms have to be made. In almost all dairying districts group schemes are now in successful operation. Although of great value, it must be pointed out that it is questionable whether vaccination will always eliminate the disease entirely from a herd. There can be no doubt, however, that it will reduce the incidence to an exceedingly low figure.

Hygiene

A further point to be mentioned in the control of brucellosis is that hygiene is most important.

Foetal membranes, the foetus, and any discharges from the animal should be disposed of immediately by burning, and, if practicable, the area surrounding the spot where the abortion occurred should be burnt.

LIVE STOCK NOTES

Compiled by A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer



A proved sire, Victoria Joyous Mercedes, with some of his daughters. This bull's 21 daughters averaged 451 lb. butterfat.

AN OUTSTANDING FRIESIAN

THE Friesian cow, Victoria Belle, recently produced 24,895 lb. of milk, 3.56 per cent. test, 887 lb. butterfat in 365 days at the State Research Farm, Werribee. Her pedigree, which is set out on page 314, shows that her ancestors have been consistent producers, and gives clear proof of the advantage gained by using proved bulls. The average production of the daughters of the sires, corrected to a mature equivalent basis, has been compared with the average mature equivalent production of their herd mates. It is customary in a well-managed herd to test a large proportion of heifers and to cull those which do not produce a desired amount of butterfat. The higher-producing cows are kept and these tend to comprise the major portion of the herd. Therefore, when yields of the daughters of a bull are compared with the herd average, the daughters of a good sire may not be as high as the herd average where that average is high.

In New Zealand, the daughters' production is compared with their dams' production, and a bull is said to be good if

his daughters average 280 lb. of butterfat when their dams average 280 lb. of butterfat. If the dams average 240 lb. of butterfat then the daughters are expected to average 250 lb., but, if the dams average 350 lb. butterfat, the daughters are only expected to produce 330 lb.; while 365 lb. butterfat is good for daughters out of dams producing 400 lb. of butterfat.

In the pedigree, the bull, Victoria Joyous Mercedes, with 21 daughters averaging 451 lb. of butterfat in a herd averaging 469 lb. of butterfat, proved to be a very good sire. The bull, Braemore Sylvia's Triumph, also showed great promise but he only sired five daughters, a number insufficient to enable a sound estimate of his ability to be made.

The average of 438 lb. of butterfat by the ten daughters of Rupertswood Inka Jo, in comparison with the herd's average of 464 lb. is also good. The production records of the cows for 273 days are shown.

The progeny of Victoria Belle include Victoria Terbell and Victoria Bellethis, two members of the Werribee herd. The heifer, Victoria Bellmore, was sold to Mr. Walter

PEDIGREE OF THE FRIESIAN COW, VICTORIA BELLE

Victoria Belle (6075)

Milk. lb.	Test. %	B.F. lb.	Age.
10,169	3.39	344	J2
14,478	3.15	457	J4
12,232	3.09	378	M
15,450	3.63	561	M
12,825	3.07	394	M
14,219	3.29	468	M
21,321	3.58	763	M

Rupertswood Inka Jo (1732)

Ten daughters averaged 438 lb. butterfat. Herd average 464 lb. butterfat

Victoria Belfry (5104)

Milk. lb.	Test. %	B.F. lb.	Age.
9,647	3.84	371	J2
13,646	3.71	507	J3
12,443	3.76	468	J4
15,938	3.49	557	M
18,458	3.60	664	M

Braemore Sylvia's Triumph (1411)

Five daughters averaged 419 lb. of butterfat. Herd averages 423 lb. butterfat

Ingolston Inka Josie (3532)

Milk. lb.	Test. %	B.F. lb.	Age.
11,424	3.86	441	J4
16,199	3.87	627	M
16,955	3.51	594	M

Victoria Joyous Mercedes (985)

Twenty-one daughters averaged 451 lb. butterfat. Herd averaged 469 lb. butterfat

Victoria Tinkle Bell (3266)

Milk. lb.	Test. %	B.F. lb.	Age.
7,710	3.86	298	J3
11,861	3.52	417	J4

Note :—All the above production records are for 273 days.

Hawker, "Anama," Central Bungaree, S.A., and the bull, Victoria Beau, was sold to Mr. S. H. Staben, Poowong East. Victoria Flashlight went to Mr. G. H. Reddie, of Lavers Hill; Victoria Denniston to Mr. D. H. Macknamara, Werribee; and Victoria Bellboy to Mr. Jack Burgman, Katandra West.

WORLD GRAIN STOCKS

The total supply of all grains in the four main exporting countries stood at 123,000,000 short tons on 1st January of this year, the lowest figure for recent years. However, wheat stocks were higher than those of a year ago, the combined supply of Australia, Argentina, Canada, and the United States amounting to 1,580,000,000 bushels, a gain of 19 per cent. as compared with the position on the same date in 1947.

The reduction in the overall grain supplies is due chiefly to the considerable decline in the 1947 United States maize crop, and, to a lesser extent, to the reduction in oats in both the United States and Canada. Substantial increases were registered in the United States and Australian supplies of wheat, while Canadian stocks diminished. Argentina's holdings rose.

WORLD PIG POPULATION

The present world population of pigs, estimated at 247,000,000, represents an increase of $2\frac{1}{2}$ per cent. over last year's

figures, but numbers are still about 41,000,000 below the 1936-40 average. A reduction in the pig population of North America was more than compensated for by increases in Brazil, China, Poland, and Russia. Europe is still the worst-affected continent insofar as pig numbers are concerned, and the ravages of the severe winter of 1946-47 in northern Europe have not yet been fully overcome, especially in countries where live stock constitutes a mainstay of agricultural economy.

In contrast with an average of the five years immediately before the war, North and South America have increased their pig populations by 9,600,000 and 3,200,000 respectively, while European numbers have fallen by 25,600,000, Russian by 20,000,000, and Asian by 8,600,000. Africa and Oceania record no significant changes.

MELBOURNE ROYAL SHOW

Entries for horses, beef and dairy cattle, goats, sheep, pigs, and poultry for this year's Melbourne Royal Show close with the Secretary, Royal Agricultural Society (Mr. Louis Monod), 422 Collins-street, Melbourne, on Saturday, 31st July. Large entries in all breeds of stock are expected, and late entries will not be accepted. A feature of the Royal Show this year is that classes have been provided for Merino sheep.

LITTLE THINGS THAT COUNT IN PIG RAISING

Pig food, particularly grain, is both scarce and expensive, and, although pig raisers cannot do much about the supply or the price, they can do a great deal towards making more efficient use of the food they receive.

There is considerable waste of food on many piggeries, both in the actual handling of the food and in the way pigs convert it to pork. Some pigs are more efficient than others in their use of food, and that variation in efficiency is affected both by their inherent make-up and by the way in which they are managed by their owners.

Food is wasted in every stage of pig production. Take as one example the amount of food involved in keeping a brood sow, and see how it affects the cost of producing her progeny. Although all sows don't eat the same quantities of food, the approximate average consumption of a mature dry sow is 6 lb. of meal daily, or its equivalent in milk or other foods. Sows are rarely fed on meal alone, or milk alone, and most get some pasture, but even pasture costs something to grow, and, whatever the sow's diet, it must be the equivalent to about 6 lb. a day while she is dry. While the sow is suckling her litter she eats more food daily, the increase depending on the number and weight of pigs she is rearing, but even during the suckling period the sow requires about 6 lb. of feed daily for her own requirements, apart from that required for the provision of milk for her offspring.

Six pounds of food daily from the time a sow conceives until she weans her litter is equivalent to about 1,000 lb. That 1,000 lb. of feed at 1½d. a lb. (with wheat at 7s. 6d. a bushel or separated milk at 1½d. a gallon) costs £6 5s., which is part of the cost of producing the progeny of the sow. If five pigs are reared in the litter, each pig's share of the £6 5s. is 25s., but, if seven pigs are reared in the litter, each pig's share of its mother's food cost is about 18s.; therefore, by rearing seven pigs instead of five in the litter the cost of each pig is reduced by about 7s., or the net return from the sale of that pig is increased by 7s.

That is just one of several phases of pig production where food could be saved.

Rearing those two extra pigs depends on selection of good breeding stock, and feeding and managing them well.

Rearing one good litter is not enough. The sow should be mated within a few days of weaning her litter, because every day she wastes is costing perhaps 6 lb. of food worth 9d.

[L. A. DOWNEY, H.D.A., Pig Expert.]

ROUNDWORMS IN PIGS

The Large Roundworm is one of the most serious of pig parasites. Its life cycle is direct—that is, no intermediate host is necessary. The eggs after being passed out in the faeces become infective in about ten to twenty days. They are extremely resistant to drying and freezing, and may persist in the soil for months. When ingested by the pig, the larvae hatch out and burrow through the intestinal wall to reach the bloodstream by which they are carried to the liver and later to the lungs and other organs.

In severe cases there is evidence of abdominal pain, excitement, increased temperature, coughing, and fast breathing with "thumps" in the flank due to pneumonic conditions in the lungs. Death may supervene in about a week. In less severe cases there is general unthriftiness and a short, harsh, frequent cough.

Various drugs have been used for the treatment of the large roundworm. In the past, oil of chenopodium was recommended at a dose rate of 1 c.c. per 25 lb. body weight, given in castor oil. Care was necessary in the administration which was by drenching after 24 hours prior starvation.

The efficacy of phenothiazine against roundworms in swine has not been as high as at first promised, and this drug is not now recommended.

Recent tests carried out with the drug sodium fluoride, however, have given excellent results. A 1-per-cent. mixture of this drug given in the feed is the optimum dose, and 95 to 100 per cent. efficiency has been claimed for it. The daily ration of the pigs to be treated should be accurately computed, and sodium fluoride added at the rate of 1 lb. of the drug to 100 lb. of food. This should be thoroughly and evenly mixed. Danger of poisoning at a 1-per-cent. level in the food can be obviated

by making sure that the food intake is well distributed over the day the pigs are dosed. Some pigs may vomit after the ingestion of the medicated food, but the illness will be temporary only. All faeces and expelled worms should be removed and destroyed.

Pigs raised for pork or bacon should be treated twice during their lifetime.

Sanitation is an effective means of control. Wherever possible pigs should be kept in age groups, as young pigs up to five or six months old are very susceptible to infestation. Yards should be well drained, and the feed and water troughs regularly cleaned.

[E. M. BROUGH, B.V.Sc., Veterinary Officer.]

MELBOURNE SHEEP SHOW

Entries greatly exceeding those of last year have been received for this year's Australian Sheep Breeders' Show. The exhibition will be held at the wool stores of Dalgety and Co. Ltd., Newmarket, on the last Friday and Saturday in July, the 30th and 31st of the month. In addition to the sheep entered for the show, a large number of stud and flock rams have been catalogued for the sales to be held in conjunction with the show. The sales will take place on the 2nd and 3rd August at the wool store of Commonwealth Wool and Produce Co. Ltd., Macauley.

Classes have been provided for all breeds of sheep, including the Merino, Polwarth, Corriedale, Border Leicester, Dorset Horn, English Leicester, Lincoln, Romney Marsh, Ryeland, Shropshire, South Down, and Suffolk. The classes for Merinos provide for superfine, fine, medium, and strong wools, grass-fed Merinos and small owners' lots.

A feature of the sheep show is a lamb carcass demonstration which is being provided by the Australian Meat Board at the request of the Graziers' Association of Victoria. This display will be held at Thos. Borthwick and Sons (Australasia) Ltd., Brooklyn, on Thursday, 29th July, the day before the show opens.

The show will provide breeders and farmers with an excellent opportunity to see some of Australia's best stud sheep, and the types of carcasses which are being produced. Those desiring to purchase stud and flock rams will have an opportunity of doing so at the sales.

POULTRY FEEDING TESTS AT THE STATE RESEARCH FARM, WERRIBEE

The table gives a comprehensive review of the feeding tests conducted at the State Research Farm for the years 1931-48 inclusive. The return over food cost is higher than that obtained on most commercial poultry farms, owing to the fact that the cost of food was arrived at by taking the average wholesale prices published in the daily press during the year; delivery charges were not added. The eggs laid were valued at the gross wholesale hen-egg price without deducting any marketing or grading charges. These charges would average approximately 4d. per dozen, which, with an average production of fourteen dozen eggs, would amount to 4s. 8d. per bird per year. The cost of rearing the birds was not taken into account, as all hens used in the tests were reared on free-range and kept there until they were drafted into the pens just prior to the commencement of the test. The factors involved such as deaths at various ages, culling of unthrifty birds, accidents, &c., make it very difficult to assess the exact amount.

In reviewing the tests since their inception, the most striking feature is that, with the many different feeding methods tried and rations that vary considerably in composition and analysis, the egg production has been consistently good.

Although satisfactory production has been obtained from many different rations, it is not advisable to continually change the ration. Slight changes may be made from time to time as the prices of the different foods vary, but any change should be made gradually.

Quality, quantity, and variety are three essentials in feeding poultry for egg production. The old idea that if hens are given plenty of food they will become fat and lazy and fail to lay has been disproved; in fact, if the birds are bred on production lines, the more food they eat the more eggs they are likely to produce.

It has also been found that variety can be more economically provided in the grain than in the mash, therefore, if several of the different grains—wheat, oats, maize, barley are used, the mash may be very plain, consisting chiefly of bran, pollard and meal and dried buttermilk, and this is the ration that is recommended.

POULTRY FEEDING TESTS, STATE RESEARCH FARM, WERRIBEE—1931-48.

Year.	Average Production.	Return Over Food Cost.	Average Price of Eggs.	Food Cost per Dozen.	Food Used per Egg.	Food Consumed per Bird per Day.	Food Cost per Week.	Mortality.
	No. of Eggs.	£. s. d.	s. d.	Pence.	oz.	oz.	Pence.	%
1931-32 ..	157	0 10 8	1 1	3.4	7.5	3.54	0.95	10.0
1932-33 ..	182	0 10 5	1 0½	4.1	7.6	3.8	1.2	6.0
1933-34 ..	163	0 9 7	1 0¼	3.7	7.1	3.5	1.1	8.4
1934-35 ..	189	0 11 5	1 0½	3.8	7.5	3.9	1.2	8.8
1935-36 ..	171	0 10 8	1 0½	3.6	6.8	3.2	1.0	8.6
1936-37 ..	188	0 12 6	1 2¾	5.2	7.3	3.7	1.6	5.0
1937-38 ..	171	0 13 7	1 5	5.6	7.3	3.4	1.5	4.6
1938-39 ..	195	0 16 6	1 4½	4.6	7.5	4.0	1.4	7.0
1939-40 ..	194	0 15 9	1 3½	4.0	7.4	3.9	1.2	9.4
1940-41 ..	185	0 12 0	1 4	6.6	8.6	4.4	2.0	10.2
1941-42 ..	183	0 14 5	1 4	4.5	7.5	3.8	1.4	13.0
1942-43 ..	171	0 16 8	1 8	6.2	9.0	4.3	1.7	..
1943-44 ..	178.2	1 0 4	1 10	5.5	8.2	4.0	1.6	..
1944-45 ..	181.5	1 1 8	1 10	5.0	8.0	4.0	1.5	8.4
1945-46 ..	163.9	0 19 1	1 9½	4.75	7.6	3.4	1.25	12.25
1946-47 ..	168.2	0 18 5	1 9½	5.75	9.0	4.2	1.5	14.0
1947-48 ..	179.9	1 2 10	2 1	6.75	8.5	4.2	2.0	5.4

The following table sets out the monthly and yearly average production of both Australorps and White Leghorns over a period of 22 years, and for the separate breeds for a period of seven years :—

AVERAGE PRODUCTION, AUSTRALORPS AND WHITE LEGHORNS DURING THEIR FIRST YEAR.

	Australorps and White Leghorns.	Australorps.	White Leghorns.
	Monthly Average Production for 22 Years.	Monthly Average Production for 7 Years.	Monthly Average Production for 7 Years.
	Eggs per Bird.	Eggs per Bird.	Eggs per Bird.
April ..	12.5	14.1	13.9
May ..	12.6	14.7	14.0
June ..	11.9	14.2	12.8
July ..	12.7	14.6	13.1
August ..	16.3	16.9	15.6
September ..	19.1	19.4	18.7
October ..	19.7	19.5	19.7
November ..	17.8	17.3	18.5
December ..	16.1	15.8	17.2
January ..	15.1	14.8	15.8
February ..	12.4	12.4	12.6
March ..	10.9	11.7	10.7
Yearly Average..	177.1	185.4	182.6

[M. D. HALL, Poultry Expert.]

BEEKEEPING

Bees will be inactive throughout the State except in the lower Murray Valley districts, and the desert areas of the north-west. Bees use a considerable amount of stores when breeding, and it is wise to see that a plentiful supply is at hand, as colonies start to move in the northern districts in July, and early August.

If a very early flow of honey eventuates from the Desert Banksia, it is imperative that the queen have ample room to lay. The bees may crowd the queen out with honey stored in the brood chamber if super room is not provided, and the colony will not reach its full strength for honey production unless unrestricted room is allowed for breeding, and storing. Occasionally, in the Desert Banksia areas extracting in July and early August has been necessary to give the queen scope for egg laying.

When a winter-honey flow is forthcoming, and pollen is not available, it is advisable to feed soya flour and skim milk powder to keep the colony in strength.

Some bees in the Murray Valley are suffering from a pollen shortage, and, unless early pollen supplies become available, bees may dwindle badly, with heavy mortality.

Bees in the Western District are in good condition on account of the prolific flow from Brown Stringy Bark. and their wintering is practically assured.

Many apiaries from the Grey Box districts are at present being moved on to Desert Banksia. Colonies that have been on Grey Box are at present in good condition insofar as bees and brood are concerned, but it is hard to forecast how they will come through the winter if left on their Grey Box locations.

[W. A. COLLINS, Apiary Inspector.]

IN THE ORCHARD

By G. W. Gayford, B.Agr.Sc., Senior Horticultural Instructor

FROST DAMAGE TO FRUIT AND VINES

OF the many hazards to which fruit crops are exposed, damage by frost can often be the most devastating. All kinds of fruit trees are susceptible to damage as a result of low temperatures caused by excessive radiation of heat from the ground

Greatest damage is likely to occur in the spring when trees are making fresh growth.

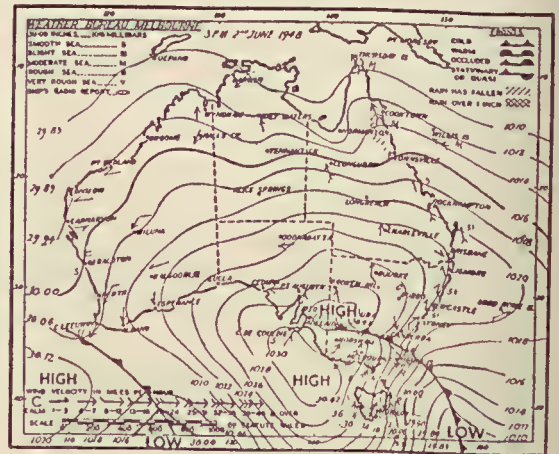
Radiation of heat from the ground becomes excessive during cool, clear, calm nights. The weather conditions most conducive to frost, as well as many other aspects of this subject, are discussed in Bulletin No. 32, Commonwealth Meteorological Bureau, "Frost in the Australian Region," by J. C. Foley. The frost danger is greatest when a low-pressure system has passed over the area and the high pressure is approaching. Under these conditions cold air has flowed over the country, bringing windy and sometimes wet conditions, and then follows a period of calm, clear weather. The arrangement of pressure systems, therefore, will give growers some idea when to expect frosty conditions.

As an example, the accompanying diagram shows the pressure systems operating over south-east Australia at 3 p.m., 2nd June, 1948. The cold front had passed over Victoria and the centre of the "high" was between Victoria and South Australia. The following morning, 3rd June, was the coldest for some months, and temperatures as low as 24°F. were experienced in parts of Victoria. Most growers will remember this occasion. However, at this time of the year, as deciduous trees enter their dormant period, there is little likelihood of much damage occurring in fruit crops, but similar conditions in the spring would cause considerable losses.

FACTORS AFFECTING THE DEGREE OF FROST

Soil Moisture

Frost damage, particularly in vine groves, is less likely to occur where the soil is moist than where it is dry. The explanation is probably due to the fact that moist soil is a better heat conductor than dry soil, and, during the day, is able to store up a greater quantity of heat than dry soil. At night heat is lost from the surface layers of the soil by radiation. The transfer back to the surface of heat stored deep in the soil is greater in a wet soil, and, consequently, the cooling rate of the surface is much lower.



Weather chart showing pressure distribution prior to frosts in Victoria.

From this factor there arises the subsidiary control measure in irrigating vine and citrus groves before an anticipated frost during the risky spring period.

Green Manure Crops

On bare soil, the region of lowest temperature during a frost is close to ground level. If the soil is covered by a crop the lowest temperature is just under crop level, which, in the case of vines, may be close to the foliage. In addition, the

green crop is a poor heat conductor and replacement of heat lost by radiation is slow. For these reasons it is most desirable that green crops in vineyards should be ploughed under before bud-burst.

Topography

The "lie of the land" is of importance in selecting a site for planting. During a frost, cold air settles in hollows and moves away from slopes or tops of rises. Low situations, therefore, should be avoided in planting vines, citrus, passion fruit, &c.

The presence of a large body of water tends to lessen the effect of frost. Plantations on slopes facing a river are less liable to damage than those which have no such outlet for cold air. The presence of timber belts or windbreaks across the line of air flow have some effect in retarding the flow of cold air. On the side of a hill, a change in slope to a flat section may have a similar effect. All of these points should be taken into consideration in setting out new plantings.

Frost Control by Heating

The use of oil burners in orchards depends on the fact that during a frost the air temperature rises as the height from ground level increases. This occurs up to heights varying between 100 to 500 feet. This temperature difference may be between 5° to 10°F, and the effect is known as "temperature inversion". By the lighting of a large number of heating units (50 to 60 per acre) the warmed air rises as high as the top of the inversion layer and, provided there is no wind, it is possible in moderate frosts to maintain the volume of air surrounding the plants at a temperature above freezing point.

Oil burners are the most popular for heating because of simplicity in operation. Costs of operation, however, are fairly high, amounting to approximately £2 per acre per four-hour period of lighting for fuel and depreciation, but excluding labour. The grower would have to estimate the probable number of nights on which heating would be required and offset the cost of this against the returns from his crop. Alarm thermometers must be installed so that the grower can ascertain when the temperature falls below danger level—usually 34°F.

Wind Machines

Various types of wind machines have been tried for frost prevention. These rely on the mixing of warmer air drawn from the upper parts of the inversion layer with the cold air at ground level. Capital expenditure for such equipment is high, involving airscrews operated by high-powered motors. In one instance, a citrus grower mounted an aeroplane motor on a tower. Labour costs are almost negligible, and the area protected is approximately five acres. A more simple and less costly type of machine, in which a fan rotates on a vertical axis, is being tried by the Council for Scientific and Industrial Research at Merbein. This device shows promise and is being subjected to further investigation.

Smoke or Smudge

It is now considered that smoke or smudge fires are practically valueless for frost control.



An experimental wind machine in a citrus grove.
[C.S.I.R., photo.]

ZINC DEFICIENCY IN DECIDUOUS TREES

Symptoms of zinc deficiency in deciduous trees have appeared in parts of the Goulburn Valley and Horsham district.

The condition is commonly called "little leaf", and the foliage of affected trees is small, narrow, and chlorotic. Twigs are slender, and short internodes near the tips produce typical rosettes of leaves. In slightly-affected trees one or two branches only may show the symptoms, but, in severe cases, the whole of the tree may suffer.

Leaves fall progressively from the base to the tips of twigs which later may die from the tips downwards.

In stone fruits interveinal chlorosis or yellowing of affected leaves is most noticeable.

Zinc sulphate sprays in the winter are the best remedy for zinc deficiency. The strength of the sprays used should be 50 lb. of zinc sulphate per 100 gallons of water. Spray either before, or two or three weeks after pruning to avoid the possibility of damage due to the spray entering freshly-cut surfaces.

[J. C. WALSH, B.Agr.Sc.,
Horticultural Instructor.]



A plum tree showing obvious signs of zinc deficiency. Note "little leaf" on the upper branches.

CONTAGIOUS ABORTION OF DAIRY CATTLE (continued from page 312).

The aborting animal should be kept in isolation for a few days, during which time any discharge should be properly disposed of, and the animal herself treated to guard against further infection by other germs, and to offset the chances of the cow getting inflammation of the breeding bag which will result in some degree of sterility. If the membranes have not come away, they should be gently removed, and irrigation of the genital tract carried out, using warm water and some disinfectant such as Lugol's iodine. The placing of a No. 10 gelatin capsule filled with 1 oz. of sulfanilamide

powder (obtainable from a chemist) up the genital tract into the uterus itself is also a wise precaution. Care should be taken, when carrying out these measures, that the operator's hands and arms are thoroughly cleaned and immersed in some disinfectant beforehand.

Owners of dairy cattle can do a great deal towards overcoming the effects of the disease in their herds by making use of calfhood vaccination by the gradual disposal of reacting animals by slaughter, and the application of hygienic measures.



THE VEGETABLE GARDEN

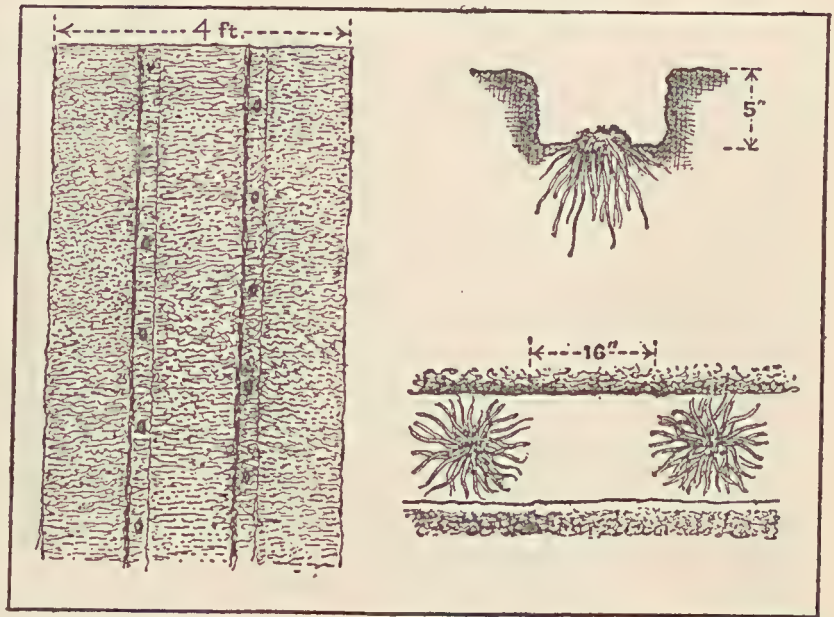
By George Hyam, Horticultural Supervisor

PLANTING ASPARAGUS

JULY is the best month to establish a new asparagus bed on soil previously prepared as described in the June issue of this Journal. If the grower has raised the plants from seed, a careful selection of the two-year-old plants for planting out will have a good effect on future yield. Select those which have grown three or four foliage stems of medium height, and reject those with one or two tall stems or dwarfed foliage. The crowns should be symmetrical with plump roots, spaced evenly around the centre. If crowns are purchased, reject any that are coarse with large centres or lopsided. It is possible that these are old or divided crowns taken from an old bed and are exhausted. The roots should not be withered. The two outstanding varieties for our conditions are *Mary Washington* and *Connover's Colossal*.

Level off the asparagus bed so that it is 8 or 9 inches above the surrounding ground, making it 4 feet wide. Run a line down the centre and 9 inches away from each side of this line take out two trenches 9 inches deep and 10 inches wide. Every 16 inches along the bottom of these trenches make a small mound for the crowns to sit on. In planting, spread the roots out as much as possible, at the same time pressing them downwards along the sides of the mounds, leaving the top of the crown 5 inches below ground level after filling in.

During the first season, no sticks are cut and the bed need not be banked up. Later, if blanched sticks are wanted, 8 or 9 inches



Method of setting out a bed of asparagus. Roots should be spread and pressed downwards as described.

of earth from the surrounding path is placed on top of the bed; if green sticks are preferred, it is only necessary to replace any soil that has been washed down from the original level.

Weed growth should be suppressed as soon as the seeds germinate by light hoeing or raking round the plants throughout the season. Avoid deep cultivation which might damage the buds. About 40 plants will give ample supplies for a household, and the bed should last for at least fifteen years.

WINTER TREATMENT OF RHUBARB

July is also the month for replanting or establishing the rhubarb bed. Like asparagus, preparation of the beds should be made a few weeks before planting (see Vegetable Notes, June issue). Sets should consist of divided portions of old, but not exhausted clumps, taken from the outside. Each should have two stem buds with a good portion of crown which is not showing the least sign of decay.

Purchased rhubarb sets should be dipped in a spraying fungicide or bulb dip before planting as a precaution against crown or root rot. The sets should be planted on a ridge about 12 inches high and 2 feet wide at the base for surface drainage. Cut back any adhering coarse roots to a distance of 2 inches from the crown and then plant so that the buds are just at soil level. In light soils they should be planted with the buds about 1 inch under the surface to allow for the settling of the soil.

Rhubarb needs plenty of space to flourish and should not be planted less than 3 feet apart. Full sun, but shelter from wind is the best situation and a change of site when replanting is desirable. Established rhubarb should be topdressed this month with a mixed fertiliser such as "market gardener's" or a mixture of 2 parts of superphosphate, 2 parts of blood and bone, and 1 part sulphate of ammonia. After removing any dead leaves, spread 3 to 4 oz. round each plant, but not too close to the crowns, and rake it under the surface.

Surplus sets can be planted in well-manured ground about 15 inches apart and these will supply some stems for this season's use. These crowns will then be exhausted and should be removed, but they will bridge a gap in production as the permanently planted sets should not be picked over for the first season after planting.

ONIONS FOR STORAGE

The late-keeping varieties of onions are planted or sown this month. Of these, *Australian Brown* or *White Imperial* will keep for seven or eight months if grown and stored properly. Commercial growers sow the seed direct and thin out, but, in the home garden, it is better to raise or purchase seedlings.

In northern districts, early planting is desirable and July is the best time to plant out seedlings. "Keeping" onions should not be forced with quick-acting manures or by overwatering but allowed to grow on steadily, otherwise their storage life is shortened. As with most onions, late planting will produce only small bulbs as they mature at the same time as those planted at the proper time.

Onions seldom need fertiliser if planted on soil that has been well manured for a previous crop, but elsewhere a dressing of blood, bone, and superphosphate at the rate of 1 oz. to the square yard should be applied.

OTHER JULY PLANTINGS

Broad beans planted in July will mature before French beans are available. The growing tips of autumn-sown broad beans should be nipped out to induce more stems to form, and a careful watch kept against bean aphid, which, if present, should be sprayed or dusted with DDT.

Parsley sown in July will produce for twelve months, after which the leaves become coarse.

Early Carman (No. 1) *potatoes* can be planted out in all districts except at high elevations, using sprouted greened sets (see April Journal). These will be ready for lifting in time for summer vegetables to be planted in the same bed.

The tall-growing *Telephone pea*, which is recommended for small gardens, can be planted in July and can be followed by tomatoes. Stakes or trellis similar to climbing beans are needed as this pea grows to a height of 6 feet, and, if necessary, the same trellis can remain for the November planting of climbing beans. Before sowing, apply superphosphate at the rate of 1 oz. per yard of row for all peas.

Greenfeast peas can now be sown, and, although low-growing, a better yield will be obtained if these are supported by some brushwood stakes or strings under garden conditions.

Other July plantings include *Parisian* cabbage, *New York*, and *Imperial* 615 lettuce and turnips.

In the north, early tomato seed can be sown if precautions are taken against frosts.

Last season's *Jerusalem* and *Chinese artichoke* tubers should be lifted early in the month before they sprout, and stored in dry sand. They will be fit for use until well into September. Select some smooth, well-shaped tubers for replanting early in August.

"Save the Forests" Campaign

Trees Supplied for Soldier Settlers

AS a result of the visit of the Minister of Forests and Agriculture, Col. A. H. Dennett, M.L.A., to the "Save the Forests" Campaign Research Nursery, the Premier, the Hon. T. T. Hollway, M.L.A., has agreed to reimburse to the Campaign the cost of raising trees for planting on soldier settlers' properties. This is in addition to the continuance of the reimbursement for community planting.

The Campaign is now able to put into operation the plan, set out below, which it had prepared after consultation with the Soldier Settlement Commission and the Land Settlement Committee of the Returned Servicemen's League.

The prime object of the scheme is utilitarian, to provide trees for such purposes as shelter-belts and farm wood-lots. The trees reserved for this distribution are:—

One thousand each—Mahogany Gum, Sugar Gum, Bushy Sugar Gum, River Red Gum, Forest Red Gum, Grey Box, Spotted Gum, and Silky Oak.

Five hundred each—Blue Gum, Blackwood, Queensland Brush Box, and Sweet Pittosporum.

There will be a limit for the first year of 100 trees for each settler.

Soldier settlers who desire to be considered under this scheme should write to the Honorary Campaign Director, "Save the Forests" Campaign, 422 Collins-street, Melbourne, C.I., stating briefly the lay-out of their property, purpose of plantation, number of trees desired, and any other particulars having a bearing on selection of types and their future growth.

The plan is as follows:—

Ten thousand trees have been reserved at the Research Nursery of the "Save the Forests" Campaign for distribution this year in accordance with the plan set out below. This will make it possible to put the plan into operation on a limited scale during the coming planting season. If more offers to take part in the scheme are

received than can be met with the trees available, those settlers who cannot be supplied this year will be given priority next year.

The purpose of such demonstration plantations is:—

(a) to test the suitability of selected trees to various districts;

(b) to test methods of preparation of ground, planting of trees, and maintenance of plantations;

(c) to improve returned servicemen's properties;

(d) to stimulate interest in tree-planting in the community.

Through Government support, the Campaign is able to supply trees for such demonstration plantations free of charge provided that conditions regarding protection, planting, maintenance, &c., are complied with.

The plan has the full support of the Soldier Settlement Commission and the Land Settlement Committee of the Returned Sailors', Soldiers' and Airmen's Imperial League of Australia.

Subject to any variation which may be found necessary as the plan develops, and within the limits of the stock available, trees will be supplied free of charge to soldier settlers on the following conditions:—

(a) The plantation shall be securely fenced against stock and vermin;

(b) The ground shall be thoroughly prepared prior to planting;

(c) Planting shall be in accordance with method recommended for each district;

(d) Care after planting shall be in accordance with methods recommended;

(e) The plantation shall be open for public inspection at times agreed to by the settler;

(f) A brief report on the progress of the plantation to be forwarded once a year by the settler to the "Save the Forests" Campaign Council.

[C. E. ISAAC, Honorary Director, "Save the Forests" Campaign.]

THE FLOWER GARDEN

By T. H. Kneen, B.Agr.Sc., Principal, School of Primary Agriculture and Horticulture, Burnley Gardens.

THE IRIS

FEW farmers can afford the time necessary to tend an elaborate garden, and, as a result, must grow plants which require a minimum of care and attention. For that matter, many city-dwellers, despite shorter working hours and greater leisure time, grow mainly shrubs, which undoubtedly give the best return for a minimum of care. There are, however, quite a number of plants of a perennial nature which merit consideration under these circumstances, and amongst them is the Iris.

The Iris family is most extensive, but the main ones grown are of easy culture under a wide range of conditions, and, once established, are, for all practical purposes, permanent.

The culture of the main species fits in well with farm conditions because the plants appreciate the dry summer period so characteristic of our climate. At the same time, the Iris responds splendidly to the care of the fancier, who can choose select varieties giving him a feeling of satisfaction similar to that of the orchid lover.

The Iris as a genus enjoys a wide distribution over the whole of the Northern Hemisphere under an extreme range of conditions. Two main groups of garden iris are recognized, those which have bulbs, such as the Dutch and Spanish Irises, and those which have thick, fleshy, creeping stems (or rhizomes), which grow at or just below ground level, such as the well-known bearded and beardless irises.

BEARDED IRISES

The bearded irises are the best known of all the garden irises. The best-known beardless types are the Siberian and Japanese Irises.

The bearded types are quite hardy, and, for the best blooms, should be grown in an open sunny position, sheltered from strong winds, especially those of spring and summer, when they will be flowering. However, a semi-shaded position should

not be a deterrent to growing them, although better results are obtained in full sun.

The soil itself should be deeply dug and not liable to water-logging. Do not use any organic manure, but dressings of lime can be applied when preparing the soil, followed in the last stage of preparation with a dressing of superphosphate at 2 oz. per square yard.

In order to obtain plants true to name it is necessary to propagate by root division. Most varieties multiply rapidly into clumps which should be lifted, divided, and reset every three or four years. This can be done almost any time after flowering until early spring, but the period January to April is generally considered the best. The clumps are easily lifted with a fork, and, after cutting out any unhealthy material, they are divided into pieces.

The underground stem of the Iris grows until it produces a flower stalk. When this happens the growth is carried on by lateral branches arising on one or both sides of the flower stalk. These growths flower and branch in the same way. The plants are, therefore, easily divided into pieces carrying only one new shoot, or more if desired. Nurserymen can generally supply roots from December until October.

The pieces should be shallowly planted with the roots firmly embedded in the soil but the rhizome exposed above the soil level. If planting groups of distinct varieties, keep the plants about 1 foot apart and the clumps 2 to 3 feet apart.

Bearded irises range in height up to 3 or 4 feet. Some dwarf kinds are suitable for rockery work, and, when used in mixed beds should be kept near the front where they will be seen. The height and the colour scheme should be studied when forming a bed. Don't forget that the bearded iris is an excellent cut flower, and, therefore, the choice of colours should be influenced by the colour scheme of the interior of the home.

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STOCK FOODS ACT

Brands Registered for 1948

By W. R. Jewell, M.Sc., Chemist for Agriculture

THE list of stock foods and stock licks registered for 1948 is given in this Journal, and should prove of interest to all users of such products. The list includes 350 stock foods and 43 stock licks, and, for convenience, the various brands are grouped into different classes. It will be seen that by-products of meat works are classified under different grades, for which standards have been set. The greater the amount of bone, the less the amount of protein, and, in order of decreasing protein content, these grades are blood meal, meat meal, meat and bone meal, and bone and meat meal. The standards, in addition to setting limits for protein content, also provide for the wholesomeness of the products and for their being ground sufficiently finely.

The different classes of stock foods are self-explanatory, some of them being prepared from only one ingredient, while others are compounded from a number of different raw materials. Included in the list is a group of vitaminized oils. Cod liver oil was, at one time, the only oil of this type on the market, but, in view of its scarcity, other oils are now available of which the basis is shark liver oil, an oil very high in vitamin A. These standardized oils contain either vitamin A or vitamins A and D; where D is present it has been added separately. These oils are satisfactory as suppliers of the vitamins named, the guaranteed analysis being in terms of vitamin content in international units per gram. A comparative value of the different brands can thus be determined from a consideration of the guaranteed analysis and the price charged.

The number of stock licks registered shows a slight increase over last year. Investigations have shown that the necessity for licks generally, and particularly for

complicated mixtures, is much less than was originally imagined, so that licks should be used with due consideration to the circumstances.

The provisions of the Stock Foods Acts are similar to those of other Acts controlling the sale of agricultural products. The manufacturer or importer is required to register any stock food he proposes to sell and his application for registration must state the raw materials used. As the value of a stock food is primarily dependent on its chemical composition, a guaranteed analysis must be supplied. This, for a stock food, states the minimum content of protein and fat and the maximum content of crude fibre. In the case of stock licks, the maximum percentage of salt is required, together with the minimum percentages of certain mineral constituents such as lime and phosphoric acid.

A label must be attached to each package, showing the distinguishing name of the stock food, the name and address of the manufacturer, the guaranteed analysis, and the weight. Farmers should not purchase unlabelled stock food and should report any instance of unlabelled bags to the Chemist for Agriculture, State Laboratories, Melbourne, C.2, to whom general inquiries relating to chemical aspects of stock foods should also be addressed. An analysis is not required on bags of bran or pollard, as standards have been set for these products to which all consignments must comply.

Inspections are made of stock foods and stock licks held by manufacturers and storekeepers and samples are taken for analysis; legal proceedings follow in cases when the analysis does not comply with that guaranteed. The Act is therefore designed primarily to protect and assist all primary producers purchasing stock foods.

LIST OF STOCK FOODS AND STOCK LICKS

REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE STOCK FOODS ACT 1936
(No. 4382) FOR THE YEAR 1948.

Distinguishing Brand Name.	Guaranteed Composition.			Where Obtainable.
	Crude Protein (N × 6.25). Minimum.	Crude Fat. Minimum.	Crude Fibre. Maximum.	
CONCENTRATED STOCK FOODS.	%	%	%	
<i>* Feeding Blood Meal.</i>				
Imperial	85.0	..	5.0	W. Angliss and Co. (Aust.) Pty. Ltd., Lynch-street, Footscray
Pannifex	75.0	2.0	5.0	H. C. Pannifex and Co. Pty. Ltd., 53-57 Munster-terrace, North Melbourne
Champion	75.0	..	5.0	Sims Cooper Freezing Works Pty. Ltd., 31 Queen-street, Melbourne
Brooklyn, T. B. and S. in diamond ..	75.0	1.5	1.0	Thos. Borthwick and Sons (A/asia) Ltd., 84 William-street, Melbourne
Portland, T. B. and S. in diamond ..	75.0	1.5	1.0	Thos. Borthwick and Sons (A/asia) Ltd., 84 William-street, Melbourne
V.I.M.A.	80.0	..	1.5	Victorian Inland Meat Authority, 54 Market-street, Melbourne
<i>† Feeding Meat Meal</i>				
M.C.C. (with bone)	57.0	10.0	5.0	Melbourne City Council, Town Hall, Melbourne
Imperial Meat Meal	60.0	8.0	2.0	W. Angliss and Co. (Aust.) Pty. Ltd., Lynch-street, Footscray
Imperial Liver Meal	65.0	18.0	..	W. Angliss and Co. (Aust.) Pty. Ltd., Lynch-street, Footscray
Pannifex	55.0	5.0	3.0	H. C. Pannifex and Co. Pty. Ltd., 53-57 Munster-terrace, North Melbourne
V.I.M.A.	55.0	13.0	1.5	Victorian Inland Meat Authority, 54 Market-street, Melbourne
<i>‡ Feeding Meat and Bone Meal.</i>				
V.I.M.A.	45.0	12.0	1.5	Victorian Inland Meat Authority, 54 Market-street, Melbourne
Mercury	50.0	12.0	1.5	Process Refiners Pty. Ltd., 582 Little Collins-street, Melbourne
Pannifex	45.0	8.0	3.0	H. C. Pannifex and Co. Pty. Ltd., 53-57 Munster-terrace, North Melbourne
Imperial Bovina	47.0	8.0	1.0	W. Angliss and Co. (Aust.) Pty. Ltd., Lynch-street, Footscray
Imperial Protein	50.0	8.0	2.0	W. Angliss and Co. (Aust.) Pty. Ltd., Lynch-street, Footscray
Cal-Phoric	45.0	15.0	2.5	Mulgrave By-Products Co., North-road, East Oakleigh
Champion	50.0	12.0	5.0	Sims Cooper Freezing Works Pty. Ltd., 31 Queen-street, Melbourne
Pioneer, No 2	45.0	10.0	2.0	J. Cockbill, Footscray-road, Footscray
T.B. and S. in diamond Brooklyn ..	50.0	12.0	4.0	Thos. Borthwick and Sons (A/asia) Ltd., 84 William-street, Melbourne
Dandy	45.0	12.0	1.66	Gippsland Co-op. Bacon Curing Co. Ltd., Dandenong
Pridham's	45.0	12.0	1.0	W. Pridham Pty. Ltd., Evans-street, Braybrook
Pennell's	50.0	6.0	4.0	G. W. Pennell, Burke-street, Braybrook
Ibis	45.0	10.0	3.0	Ficken, Halliday, and McClelland Pty. Ltd., 634 Bourke-street, Melbourne
M.S.C.	50.0	10.0	3.5	The Mildura Shire Council, Mildura
<i>Bone and Meat Meal.</i>				
Apollo	40.0	7.0	1.5	J. Kitchen and Sons Pty. Ltd., Ingles-street, Port Melbourne
J.K.S.	40.0	7.0	2.5	J. Kitchen and Sons Pty. Ltd., Ingles-street, Port Melbourne
Trident	40.0	15.0	5.0	Sims Cooper Freezing Works Pty. Ltd., 31 Queen-street, Melbourne
Pannifex	40.0	5.0	5.0	H. C. Pannifex and Co. Pty. Ltd., 53-57 Munster-terrace, North Melbourne
Apex	40.0	10.0	3.0	North-Eastern Bone Products, Wangaratta

* Standard not less than 75 per cent. crude protein and not more than 5 per cent. crude fibre.

† Standard not less than 55 per cent. crude protein and not more than 7 per cent. phosphoric acid. 100 per cent. must pass through a 10-mesh sieve.

‡ Standard not less than 45 per cent. crude protein. 100 per cent. must pass through a 10-mesh sieve.

LIST OF STOCK FOODS AND STOCK LICKS—continued.

Distinguishing Brand Name.	Guaranteed Composition.			Where Obtainable.
	Crude Protein (N x 6.25). Minimum.	Crude Fat. Minimum.	Crude Fibre. Maximum.	
	%	%	%	
CONCENTRATED STOCK FOODS—continued.				
<i>Milk Products.</i>				
Krafco (Dried Whey)	10.0	0.5	..	Kraft Walker Cheese Co. Pty. Ltd., Riverside-avenue, South Melbourne
Kraftone (Dried Whey)	10.0	0.5	..	Kraft Walker Cheese Co. Pty. Ltd., Riverside-avenue, South Melbourne
Lactokraft (Dried Whey)	10.0	0.1	..	Kraft Walker Cheese Co. Pty. Ltd., Riverside-avenue, South Melbourne
Maffco Buttermilk Powder	30.0	5.0	..	Maffra Co-op. Milk Products Co. Ltd., Maffra
K.B.F. Buttermilk Powder	30.0	6.0	..	Korumburra and District Co-op. Butter Factory and Trading Co. Ltd., Korumburra
Allansford Buttermilk Powder	30.0	7.0	..	Warrnambool Cheese and Butter Factory Co. Ltd., Allansford
Longbar Whey Powder	11.0	0.5	..	Alfred Barrow Pty. Ltd., 47 King-street, Melbourne
Milway Milk Product	20.0	18.0	1.5	Kraft Walker Cheese Co. Pty. Ltd., Riverside-avenue, South Melbourne
Colac Dried Milk Albumen	54.0	5.0	0.2	Colac Dairying Co. Ltd., Colac
<i>Oil-Seed or Cake Meals and Nuts.</i>				
Eta Peanut Meal	49.0	2.0	6.0	Nut Foods Pty. Ltd., 271 Grant-street, South Melbourne
Meggitt's Linseed Oil Meal	30.0	6.0	10.0	Meggitt Ltd., Hobson's-road, South Kensington
Meggitt's Linseed Sheep Nuts	30.0	6.0	10.0	Meggitt Ltd., Hobson's-road, South Kensington
*Sunlight Oil-cake	20.0	5.0	7.5	J. Kitchen and Sons Pty. Ltd., Ingles-street, Port Melbourne
*Key Meal	20.0	5.0	7.5	J. Kitchen and Sons Pty. Ltd., Ingles-street, Port Melbourne
*Groundnut Cake	45.0	5.5	5.0	J. Kitchen and Sons Pty. Ltd., Ingles-street, Port Melbourne
MIXED STOCK FOODS.				
<i>For Pigs.</i>				
Barastoc Pig Cubes	15.0	3.0	6.0	Barastoc Products, 395 Collins-street, Melbourne
Barastoc Topping-off Pig Cubes	12.5	3.0	6.0	Barastoc Products, 395 Collins-street, Melbourne
Osmond's Codliverine (Pigs)	19.0	14.0	9.0	Osmond and Sons (Aust.) Pty. Ltd., 35 William-street, Melbourne
Clark's Pig Starter	17.0	4.0	6.0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Clark's Gro-Pig	16.0	3.0	4.0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Cohana Pig Meal	15.0	2.0	7.0	Cohana Stockfood Co., Williamstown
<i>For Calves.</i>				
Harper's Star Calf Food	12.0	12.5	7.0	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
*Parsons' Calf Food	12.0	2.0	6.0	Parsons Bros. and Co. Pty. Ltd., 554-562 Flinders-lane, Melbourne
Excello Calf Food	11.0	4.0	3.0	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
Ayrshire Calf Food	13.38	2.45	4.0	James Raiton, 133 Elizabeth-street, Melbourne
Ward's Calf Food	9.0	3.0	7.0	H. S. K. Ward Pty. Ltd., 24-38 Spencer-street, Melbourne
Vetamac Calf Food	15.35	7.5	1.5	A. H. McDonald, 627 Bridge-road, Richmond
Velox Calf Food	14.5	2.9	4.0	H. C. Allen, Newcombe-street, Portarlington
Gro-calf	20.0	4.0	4.0	Clark, King and Co. Pty. Ltd., 237 Queen-street, Melbourne
Kaf-o-vite	16.5	9.5	7.5	Goldsbrough, Mort, and Co. Ltd., 526 Bourke-street, Melbourne
Barastoc Calf Pellets	17.0	4.0	6.5	Barastoc Products, 395 Collins-street, Melbourne
Federal	20.4	8.2	5.1	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
Taylor's National Calf Food	14.0	2.6	4.6	National Cattle and Poultry Food Co., 75 Francis-street, Melbourne
A.H.P. Vealo Calf Food	30.0	7.0	10.0	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne
Western Calf Food	20.0	4.0	9.0	Wm. Haughton and Co. Pty. Ltd., 545 Little Collins-street, Melbourne
Rudduck's Calf Food	17.0	2.3	3.5	Rudduck and Co. Pty. Ltd., 556 Lonsdale-street, Melbourne
Champion Calf Food	12.0	5.0	5.0	Werona Products, 592 Burwood-road, Auburn

* Contains 1 per cent. salt.

Distinguishing Brand Name.	Guaranteed Composition.			Where Obtainable.
	Crude Protein (N x 6.25). Minimum.	Crude Fat. Minimum.	Crude Fibre. Maximum.	
MIXED STOCK FOODS—continued.	%	%	%	
<i>For Dairy Cows.</i>				
Lambert's Dairy Mixture No. 3 ..	15.0	5.0	8.0	T. H. A. Lambert Pty. Ltd., 696 High-street Kew
Barastoc Dairy Cow Cubes No. 2 ..	14.0	3.5	10.5	Barastoc Products, 395 Collins-street, Melbourne
Barastoc Dairy Cow Meal E. ...	14.0	3.5	10.5	Barastoc Products, 395 Collins-street, Melbourne
Mormilk No. 2 ..	20.0	4.75	14.0	H. C. Pannifex and Co. Pty. Ltd., 53-57 Munster- terrace, North Melbourne
Clark's Dairy-Mex No. 2 ..	18.0	3.0	8.0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
† Vetamac Medicated Dairy Meal ..	10.0	2.5	5.0	A. H. McDonald, 627 Bridge-road, Richmond
Cohana Blended Cow Feed ..	11.0	2.5	7.0	Cohana Stockfood Co., Williamstown
* Parsons' Dairy Cow Meal ..	17.0	3.5	17.0	Parsons Bros. and Co. Pty. Ltd., 554 Flinders-lane, Melbourne
and F. Dairy Cow Meal ..	15.0	3.0	8.0	Poultrymen and Farmers Trading Co., 276 Queensberry-street, North Melbourne
Champton Cow Meal ..	15.0	5.0	11.0	Werona Products, 592 Burwood-road, Auburn
<i>General.</i>				
Osmond's Codliline ..	20.0	14.0	9.0	Osmond and Sons (Aust.) Pty. Ltd., 35 William- street, Melbourne
Cowling's Proteinized Ground Wheat ..	13.0	2.5	6.0	W. Cowling, Market Square, Bendigo
Purity Protein Meal ..	15.0	3.0	5.0	Wise Bros. Pty. Ltd., 530 Collins-street, Melbourne
Cohana Universal Pellets ..	16.0	3.0	5.0	Cohana Stock Food Co., Williamstown
Parsons' Stock Mixture ..	15.0	6.0	16.0	Parsons Bros. and Co. Pty. Ltd., 554 Flinders-lane Melbourne
<i>Poultry Foods.</i>				
Harper's Prepared Grain ..	8.5	9.0	4.5	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Clark's Laymor ..	17.0	4.0	6.0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Clark's Gro-chick ..	16.0	4.0	6.0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Eggoleen No. 2 ..	40.0	10.0	3.0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Clark's Chick-starter ..	17.0	4.0	6.0	Clark, King and Co. Pty. Ltd., 237 Queen-street, Melbourne
Clark's Turkey Starter ..	18.0	4.0	6.0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Clark's Breeders' Mash ..	16.0	4.0	6.0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Clark's Fatner ..	14.0	4.0	6.0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Warragul Laying Mash ..	14.0	4.5	4.2	Warragul Egg Circle, Warragul
Warragul Growing Mash ..	14.0	5.9	5.2	Warragul Egg Circle, Warragul
Cowling's Laying Mash ..	14.0	2.5	7.0	W. Cowling, Market Square, Bendigo
Cowling's Chick Mixture ..	10.0	1.25	3.0	W. Cowling, Market Square, Bendigo
Cowling's Chick Starter ..	15.5	3.0	5.0	W. Cowling, Market Square, Bendigo
Cowling's Growing Grain ..	12.0	1.5	4.0	W. Cowling, Market Square, Bendigo
Barastoc Poultry Pellets E W (Layers) ..	16.0	4.0	7.0	Barastoc Products, 395 Collins-street, Melbourne
Barastoc Chick Pellets ..	16.0	4.5	7.0	Barastoc Products, 395 Collins-street, Melbourne
Barastoc Poultry Grower's Pellets A ..	14.0	4.0	7.0	Barastoc Products, 395 Collins-street, Melbourne
Barastoc Poultry Pellets W (Growers) ..	14.0	4.0	7.0	Barastoc Products, 395 Collins-street, Melbourne
Barastoc Poultry Layers' Pellets E ..	16.0	4.0	7.0	Barastoc Products, 395 Collins-street, Melbourne
Barastoc Duck Fattening Pellets ..	15.0	3.0	6.0	Barastoc Products, 395 Collins-street, Melbourne
Ward's Chick Meal ..	10.0	4.0	5.0	H. S. K. Ward Pty. Ltd., 24-38 Spencer-street, Melbourne
Osmond's Codliline for Poultry ..	19.0	12.0	9.0	Osmond and Sons (Aust.) Pty. Ltd., 35 William- street, Melbourne
Excello Growing Mash ..	9.0	3.4	7.0	Lyall and Sons Pty. Ltd., 39-51 Leveson-street, North Melbourne
Excello Laying Mash ..	13.0	4.0	7.0	Lyall and Sons Pty. Ltd., 39-51 Leveson-street, North Melbourne
Clark's Vitamilk ...	31.0	6.0	1.0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Mercury Poultry Food Concentrate ..	29.0	5.0	2.0	Process Refiners Pty. Ltd., 582 Little Collins-street, Melbourne
Lambert's Chicken Starter ..	17.0	4.0	6.0	T. H. A. Lambert Pty. Ltd., 696 High-street, Kew
Lambert's Laying Mash ..	17.0	4.0	6.0	T. H. A. Lambert Pty. Ltd., 696 High-street, Kew
Cohana Blended Poultry Food ..	15.0	2.5	4.5	Cohana Stockfood Co., Williamstown
A.B.C. Growing Mash ..	14.0	4.0	5.3	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
A.B.C. Laying Mash ..	16.0	3.5	7.0	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
A.B.C. Werribee Mash ..	11.0	3.5	4.5	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
Marvel Laying Mash ..	15.0	2.4	6.0	J. McBeth, 207 Neerim-road, Carnegie

* Contains 1 per cent. salt.

† Contains 26.0 per cent. salt.

LIST OF STOCK FOODS AND STOCK LICKS—continued.

Distinguishing Brand Name.	Guaranteed Composition.			Where Obtainable.
	Crude Protein (N x 6.25). Minimum.	Crude Fat. Minimum.	Crude Fibre. Maximum.	
MIXED STOCK FOODS—continued.	%	%	%	
Poultry Foods—continued.				
Marvel Chick Mash	16.0	4.0	6.0	J. McBeth, 207 Neerim-road, Carnegie
Marvel Growing Mash	16.0	4.0	6.0	J. McBeth, 207 Neerim-road, Carnegie
Par-Meal Special Laying Mash	15.0	4.25	5.5	Parsons Bros. and Co. Pty. Ltd., 554 Flinders-lane, Melbourne
Parsons' Poultry Mash	16.0	8.0	11.0	Parsons Bros. and Co. Pty. Ltd., 554 Flinders-lane, Melbourne
Parsons' Special Chick Mash	14.0	4.0	7.0	Parsons Bros. and Co. Pty. Ltd., 554 Flinders-lane, Melbourne
Cole's Chick Food	13.6	2.9	5.0	Cole's Poultry Farm, Carlsbrook
Gem Laying Mash	16.0	4.0	9.0	Burrow's Hume Flour Mills, Albury
Gem Chicken Mixture	10.0	2.0	4.0	Burrow's Hume Flour Mills, Albury
Pannifex Poultry Pusher	32.0	7.0	8.0	H. C. Pannifex and Co. Pty. Ltd., 53 Munster-terrace, North Melbourne
V.W.C. Growing Mash	13.0	3.75	5.5	Victorian Wheatgrowers Corp. Ltd., 17 Queen-street, Melbourne
V.W.C. Laying Mash	17.0	2.0	2.5	Victorian Wheatgrowers Corp. Ltd., 17 Queen-street, Melbourne
V.W.C. Chick Starter	16.0	2.25	4.0	Victorian Wheatgrowers Corp. Ltd., 17 Queen-street, Melbourne
V.W.C. Kibbled Maize and Wheat	9.25	1.6	3.0	Victorian Wheatgrowers Corp. Ltd., 17 Queen-street, Melbourne
P. and F. Special Chick Mixture	11.0	3.5	6.0	Poultrysmen and Farmers Trading Co., 276 Queensberry-street, North Melbourne
P. and F. Competition Laying Mash	18.0	5.0	6.5	Poultrysmen and Farmers Trading Co., 276 Queensberry-street, North Melbourne
P. and F. Growing Mash	14.0	4.0	5.3	Poultrysmen and Farmers Trading Co., 276 Queensberry-street, North Melbourne
P. and F. Competition Laying Pellets	18.0	4.5	7.0	Poultrysmen and Farmers Trading Co., 276 Queensberry-street, North Melbourne
P. and F. Competition Growing Pellets	14.0	4.0	6.0	Poultrysmen and Farmers Trading Co., 276 Queensberry-street, North Melbourne
P. and F. Competition Chick Pellets	16.0	4.0	6.5	Poultrysmen and Farmers Trading Co., 276 Queensberry-street, North Melbourne
Champion Laying Mash	16.0	5.0	7.0	Verona Products, 592 Burwood-road, Auburn
WHEAT AND WHEAT BY-PRODUCTS.				
Lyalls' Wheat Meal	9.0	3.0	4.0	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
Clark's Wheat Meal	9.0	1.0	3.0	Clark, King and Co. Pty. Ltd., 237 Queen-street, Melbourne
Pratt's Ground Wheat	9.5	1.5	3.5	David Pratt and Sons, Mair-street, Ballarat
Connell's Wheat Polishing No. 1	14.0	4.0	3.5	John Connell and Co. Ltd., 578 Bourke-street, Melbourne
Connell's Wheat Polishing No. 2	13.5	5.0	9.0	John Connell and Co. Ltd., 578 Bourke-street, Melbourne
Maryborough Crushed Wheat	9.5	2.0	2.5	Maryborough Flour Mills Pty. Ltd., Maryborough
Wangaratta Crushed Wheat	8.5	1.5	2.5	Wangaratta Flour Mills Co. Pty. Ltd., Wangaratta
Water Wheel Ground Wheat	9.5	1.5	2.5	Water Wheel Flour Mills Pty. Ltd., 83 William-street, Melbourne
Darling's Wheat Meal	10.5	2.5	3.5	John Darling and Son, 44 King-street, Melbourne
Garden City Crushed Wheat	9.6	1.5	2.5	Garden City Flour Mill, Ballarat
Kimpton's Crushed Wheat	8.5	1.5	3.0	W. S. Kimpton and Sons, 395 Collins-street, Melbourne
McLennan's Wheat Meal	8.5	1.5	3.0	McLennan and Co. Pty. Ltd., Mooroopna
Willis' Wheat Stock Feed	9.5	2.0	3.0	Willis Bros., Kyneton
Minifie's Ground Wheat	9.5	1.5	3.0	Jas. Minifie and Co. Pty. Ltd., 422 Collins-street, Melbourne
Stratton's Wheat Meal	9.5	2.0	3.0	Stratton and Co. Pty. Ltd., 68 Lurie-street, Abbotsford
Cowling's Ground Wheat	9.5	2.0	2.5	W. Cowling, Market Square, Bendigo
Noske Bros. Crushed Wheat	9.5	2.0	2.5	Noske Bros. Pty. Ltd., 108 Queen-street, Melbourne
Schutt and Barrie Wheat Stock Meal	9.5	2.0	2.5	Schutt and Barrie Flour Mills Pty. Ltd., Geelong-road, West Footscray
Thomas' Crushed Wheat	9.5	2.0	2.5	W. C. Thomas and Sons Pty. Ltd., 55 William-street, Melbourne
Hutchinson's Wheat Meal	9.5	2.0	2.5	Hutchinsons Finley Flour Milling and Agency Co. Pty. Ltd., Glenroy
Burrows' Stock Meal	9.0	2.0	3.5	Burrows Hume Flour Mills, Albury
Lambert's Wheat Meal	9.5	2.0	2.5	T. H. A. Lambert Pty. Ltd., 696 High-street, Kew
Williams' Rolled Wheat	9.5	2.0	2.5	Henry E. Williams and Sons Pty. Ltd., 9 High-street, Maryborough
Parsons' Wheat Polishings	13.5	3.75	5.5	Parsons Bros. and Co. Pty. Ltd., 554-562 Flinders-lane, Melbourne
Morgrain Wheat Meal	9.0	3.0	4.0	Norris and Wilkinson, Tinning-street, Brunswick
Williams' Rolled Wheat Meal	9.5	1.5	3.0	Henry E. Williams and Sons Pty. Ltd., Maryborough
Marvel Wheat Meal	9.5	2.0	3.5	J. McBeth, 207 Neerim-road, Carnegie
A.B.C. Wheat Meal	9.0	3.0	4.0	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
Grant and Wilson Crushed Wheat	8.5	1.5	2.5	Grant and Wilson, Yarrowonga

Distinguishing Brand Name.	Guaranteed Composition.			Where Obtainable.
	Crude Protein (N x 6.25). Minimum.	Crude Fat. Minimum.	Crude Fibre. Maximum.	
WHEAT AND WHEAT BY-PRODUCTS— <i>continued.</i>	%	%	%	
Tomlins Simmie Ground Wheat ..	9.5	2.0	2.5	Tomlins, Simmie and Co., Bendigo
Lanray Wheat Polishings ..	12.0	4.0	7.0	Lanray Milling Co. Pty. Ltd., 131 Queen-street, Melbourne
Tyner's Ground Wheat ..	9.5	1.5	2.5	W. Tyner Pty. Ltd. 623 Collins-street, Melbourne
Cohana Wheat Meal ..	9.5	2.0	2.5	Cohana Stockfood Co., Williamstown
Cohana Crushed Wheat ..	9.5	2.0	2.5	Cohana Stockfood Co., Williamstown
V.W.C. Crushed Wheat ..	9.5	1.5	3.0	Victorian Wheatgrowers Corp. Ltd., 17 Queen-street, Melbourne
V.W.C. Ground Wheat ..	9.5	1.5	3.0	Victorian Wheatgrowers Corp. Ltd., 17 Queen-street, Melbourne
P. and F. Wheatmeal ..	9.5	3.0	2.5	Poultrymen and Farmers Trading Co., 276 Queensberry-street, North Melbourne
Echuca Crushed Wheat ..	9.5	2.0	3.0	Echuca Flour Mills Pty. Ltd., Echuca
Crushed Wheat ..	9.5	1.5	2.5	North-Eastern Co-op. Soc. Ltd., Wangaratta
Minifie's Ground Wheat ..	9.5	1.5	3.0	Jas. Minifie and Co. Pty. Ltd., 422 Collins-street, Melbourne
Crushed Wheat ..	9.5	1.5	3.5	J. E. Handbury and Son Pty. Ltd., 33-35 King-street, Melbourne
BRAN AND POLLARD.				
The following firms have registered distinguishing brand names for Bran and Pollard:—				
T. Brunton and Co. Pty. Ltd. ..	..	..	..	531 Collins-street, Melbourne
Burnley Flour Mills Pty. Ltd. ..	..	..	..	376 Swan-street, Burnley
Darling (John) and Son ..	..	..	..	44 King-street, Melbourne
Echuca Flour Mills Pty. Ltd. ..	..	..	..	Echuca
Garden City Flour Mill ..	..	..	..	Trench-street, Ballarat
Grant and Wilson ..	..	..	..	McNally-street, Yarrowonga
Kimpton (W. S.) and Sons ..	..	..	..	395 Collins-street, Melbourne
Maryborough Flour Mills Pty. Ltd. ..	..	..	..	Maryborough
McLennan and Co. Pty. Ltd. ..	..	..	..	Mooroopna
Minifie (James) and Co. Pty. Ltd. ..	..	..	..	422 Collins-street, Melbourne
Noske Bros. Pty. Ltd. ..	..	..	..	108 Queen-street, Melbourne
Schutt and Barrie Flour Mills Pty. Ltd. ..	..	..	..	Geelong-road, West Footscray
Silver Lake Flour Mill Pty. Ltd. ..	..	..	..	Sale
Smith (W. and P.) ..	..	..	..	35 Cusack-street, Wangaratta
Stratton and Co. Pty. Ltd. ..	..	..	..	68 Lullie-street, Abbotsford
Swan Milling Co. ..	..	..	..	Swan Hill and 1 Bent-street, Northcote
Sunraysia Flour Mills Pty. Ltd. ..	..	..	..	Mildura
Thomas (W. C.) and Sons Pty. Ltd. ..	..	..	..	55 William-street, Melbourne
Tomlins, Simmie and Co. ..	..	..	..	87 Charleston-road, Bendigo
Wangaratta Flour Mills Co. Pty. Ltd. ..	..	..	..	Wangaratta
Willis Bros. ..	..	..	..	Kyneton
Wimmera Flour Mill Co. Pty. Ltd. ..	..	..	..	Stawell
Water Wheel Flour Mills Pty. Ltd. ..	..	..	..	83 William-street, Melbourne
Wise Bros. Pty. Ltd. ..	..	..	..	530 Collins-street, Melbourne
Howard Jackett and Co. Pty. Ltd. ..	..	..	..	534 Bridge-road, Richmond
Hudson and Co. Pty. Ltd. (Bran only) ..	..	..	..	Harcourt-parade, Richmond
Hutchinson's Finley Flour Milling and Agency Co. Pty. Ltd. ..	..	..	..	Glenroy
Burrows Hume Flour Mills ..	..	..	..	Albury
Corowa Milling Co. Ltd. ..	..	..	..	Corowa
Elmore Flour Mills Pty. Ltd. ..	..	..	..	Elmore
Creamota Bran ..	15.4	4.0	9.0	Creamota Ltd., Sunshine-road, West Footscray
† The 1948 Chemical Standard for Bran is ..	14.0	2.5	10.0	
† The 1948 Chemical Standard for Pollard is ..	14.0	3.0	6.25	
OAT PRODUCTS.				
Parsons' No. 1 Oat Branning ..	10.0	6.75	16.0	Parsons Bros. and Co. Pty. Ltd., 554-562 Flinders- lane, Melbourne
Parsons' No. 2 Oat Branning ..	7.5	5.75	15.25	Parsons Bros. and Co. Pty. Ltd., 554-562 Flinders- lane Melbourne
Harpers' Star Oat Branning ..	8.0	6.5	20.0	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Ward's Oat Branning ..	6.0	4.0	25.0	H. S. K. Ward Pty. Ltd., 24-38 Spencer-street, Melbourne
Connell's Oat Branning ..	8.0	5.5	24.0	John Connell and Co. Ltd., 578 Bourke-street, Melbourne
McKenzie's Oat Branning ..	7.0	4.0	20.0	J. F. McKenzie and Co. Pty. Ltd., 74 Queensbridge- street, South Melbourne
Creamota Brannings ..	8.5	5.5	25.0	Creamota Ltd., Sunshine-road, West Footscray

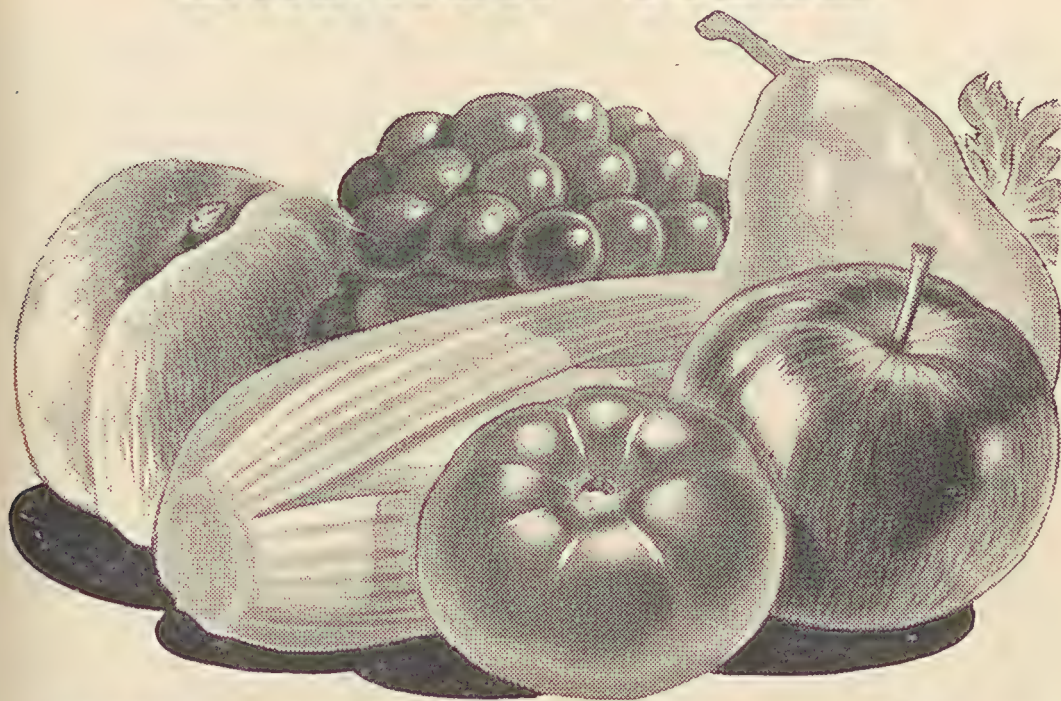
Distinguishing Brand Name.	Guaranteed Composition.			Where Obtainable.
	Crude Protein (N x 6.25). Minimum.	Crude Fat. Minimum.	Crude Fibre. Maximum.	
BARLEY PRODUCTS—continued.				
	%	%	%	
Parsons' No. 2 Oat Screenings ..	8.5	5.5	13.25	Parsons Bros. and Co. Pty. Ltd., 554-562 Flinders-lane, Melbourne
Parsons' No. 3 Oat Screenings ..	7.0	5.0	21.25	Parsons Bros. and Co. Pty. Ltd., 554-562 Flinders-lane, Melbourne
Connell's Oat Pollard ..	11.8	9.0	2.0	John Connell and Co. Ltd., 578 Bourke-street, Melbourne
Lyall's Oat Pollard ..	10.0	7.0	7.0	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
McKenzie's Oat Pollard ..	10.0	8.0	5.0	J. F. McKenzie and Co. Pty. Ltd., 74 Queensbridge-street, South Melbourne
T.B. and S. Oat Screenings ..	9.0	5.0	15.0	T. Borthwick and Sons (A/asia) Ltd., 84 William-street, Melbourne
T.B. and S. Oat Pollard ..	13.0	7.0	2.0	T. Borthwick and Sons (A/asia) Ltd., 84 William-street, Melbourne
T.B. and S. Oat Branning ..	10.0	5.0	15.0	T. Borthwick and Sons (A/asia) Ltd., 84 William-street, Melbourne
Lanray No. 1 Oat Branning ..	10.0	6.75	16.0	Lanray Milling Co. Pty. Ltd., 131 Queen-street, Melbourne
Lanray No. 2 Oat Branning ..	7.5	3.0	25.0	Lanray Milling Co. Pty. Ltd., 131 Queen-street, Melbourne
Cohana Crushed Oats ..	10.0	4.0	7.0	Cohana Stockfood Co., Williamstown
Cohana Ground Oats ..	10.0	4.0	7.0	Cohana Stockfood Co., Williamstown
P. and F. Oaten Meal ..	10.0	6.0	3.0	Poultrymen and Farmers Trading Co., 276 Queensberry-street, North Melbourne
A.B.C. Oat Branning ..	6.0	4.0	25.0	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
A.B.C. Oat Pollard No. 2 ..	10.0	8.0	5.0	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
Garden City Crushed Oats ..	10.7	6.5	12.5	Garden City Flour Mill, Ballarat
Crushed Oats ..	8.0	3.0	3.5	North-Eastern Co-op. Soc. Ltd., Wangaratta
Crushed Oats ..	10.0	4.5	11.5	J. E. Handbury and Son Pty. Ltd., 33-35 King-street, Melbourne
RYE PRODUCT.				
Lyall's Rye Meal ..	9.0	3.0	4.0	Lyall and Sons Pty. Ltd., 39-51 Leveson-street, North Melbourne
BARLEY PRODUCTS.				
Harpers Star Barley Meal ..	12.5	5.5	7.0	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Ward's Barley Meal ..	10.0	4.0	10.0	H. S. K. Ward Pty. Ltd., 24-38 Spencer-street, Melbourne
Lyall's Barley Meal ..	10.0	2.0	5.0	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
Connell's Barley Meal ..	10.4	4.5	7.0	John Connell and Co. Ltd., 578 Bourke-street, Melbourne
A.B.C. Barley Meal ..	10.0	4.0	10.0	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
Lanray Barley Meal ..	9.0	2.5	20.0	Lanray Milling Co. Pty. Ltd., 131 Queen-street, Melbourne
Pratt's Ground Barley ..	7.0	1.0	7.0	David Pratt and Sons, Mair-street, Ballarat
Connell's Barley Branning ..	10.4	6.0	20.0	John Connell and Co. Ltd., 578 Bourke-street, Melbourne
Harper's Star Barley Branning ..	10.0	5.0	15.0	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Parsons' Barley and Oat Pollard ..	11.0	5.5	10.0	Parsons Bros. and Co. Pty. Ltd., 554-562 Flinders-lane, Melbourne
Lyall's Barley and Oat Meal ..	10.0	4.0	7.0	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
McKenzie's Barley Pollard ..	12.0	3.0	20.0	J. F. McKenzie and Co. Pty. Ltd., 74 Queensbridge-street, South Melbourne
Parsons' Barley Meal ..	14.0	6.0	9.0	Parsons Bros. and Co. Pty. Ltd., 554-562 Flinders-lane, Melbourne
Cohana Barley Meal ..	10.0	4.0	7.0	Cohana Stockfood Co., Williamstown
P. and F. Barley Meal ..	9.0	2.0	5.0	Poultrymen and Farmers Trading Co., 276 Queensberry-street, North Melbourne
Kelrie (Dried Brewers' Distillers' Grains)	18.0	4.0	17.0	K.B. Stock Food Co. Pty. Ltd., 48 Wellington-street, Collingwood
A.B.C. Barley and Oat Pollard ..	11.0	5.5	10.0	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
Crushed Barley ..	8.0	3.0	3.5	North-Eastern Co-op. Soc. Ltd., Wangaratta

LIST OF STOCK FOODS AND STOCK LICKS—continued.

Distinguishing Brand Name.	Guaranteed Composition.			Where Obtainable.
	Crude Protein (N x 6.25). Minimum.	Crude Fat. Minimum.	Crude Fibre. Maximum.	
	%	%	%	
RICE PRODUCTS.				
Harper's Star White Rice Meal ..	9.0	12.5	5.0	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Harper's Star Brown Rice Meal ..	10.0	16.0	7.5	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Parsons' Rice Meal	10.0	19.0	9.5	Parsons Bros. and Co. Pty. Ltd., 554-562 Flinders-lane, Melbourne
Harper's Rice Bran	6.0	7.0	20.0	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
McKenzie's Rice Pollard	10.0	15.0	8.0	J. F. McKenzie and Co. Pty. Ltd., 74 Queensbridge-street, South Melbourne
A.B.C. Rice Bran	5.0	6.0	40.0	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
A.B.C. Rice Pollard	10.0	15.0	8.0	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
MAIZE PRODUCTS.				
Polly Gluten Feed	20.0	3.0	9.0	Maize Products Pty. Ltd., corner Parker and Maribyrnong streets, Footscray
Maize Oil Meal'	16.0	12.0	10.0	Maize Products Pty. Ltd., corner Parker and Maribyrnong streets, Footscray
Ward's Maize Meal	7.0	3.0	4.0	H. S. K. Ward Pty. Ltd., 24-38 Spencer-street, Melbourne
Lyall's Maize Meal	9.0	3.0	3.0	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
Clark's Maize Meal	9.0	3.0	3.0	Clark, King and Co. Pty. Ltd., 237 Queen-street, Melbourne
Pratt's Ground Maize	7.0	2.0	3.5	David Pratt and Sons, Mair-street, Ballarat
Parsons' Wet Maize Bran	3.0	1.0	2.0	Parsons Bros. and Co. Pty. Ltd., 554-562 Flinders-lane, Melbourne
A.B.C. Maize Meal	7.0	3.0	4.0	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
Morgrain Maize Meal	9.0	3.0	3.0	Norris and Wilkinson, Tinning-street, Brunswick
V.W.O. Maize Meal	9.0	3.0	2.0	Victorian Wheatgrowers Corp. Ltd., 17 Queen-street, Melbourne
Marvel Maize Meal	8.0	3.0	4.0	J. McBeth, 207 Neerim-road, Carnegie
P. and F. Maize Meal	9.0	4.0	3.0	Poultrymen and Farmers Trading Co., 276 Queensberry-street, North Melbourne
Crushed Maize	10.0	4.0	7.5	North-Eastern Co-op. Soc. Ltd., Wangaratta
PEA PRODUCTS.				
Parsons' Pea Meal	16.0	1.5	18.75	Parsons Bros. and Co. Pty. Ltd., 554-562 Flinders-lane, Melbourne
Ward's Pea Meal	14.0	1.0	18.0	H. S. K. Ward Pty. Ltd., 24-38 Spencer-street, Melbourne
Harper's Split Pea Screenings	15.0	0.75	17.0	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Parsons' Pea Screenings	16.25	1.0	6.0	Parsons Bros. and Co. Pty. Ltd., 554-562 Flinders-lane, Melbourne
McKenzie's Pea Pollard	20.0	1.0	10.0	J. F. McKenzie and Co. Pty. Ltd., 74 Queensbridge-street, South Melbourne
A.B.C. Pea Meal	20.0	1.0	10.0	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
P. and F. Pea Meal	20.0	1.0	6.0	Poultrymen and Farmers Trading Co., 276 Queensberry-street, North Melbourne
HULLS.				
Parsons' Barley Hulls	2.5	0.6	39.75	Parsons Bros. and Co. Pty. Ltd., 554-562 Flinders-lane, Melbourne
Connell's Barley Dust	5.0	0.25	18.0	John Connell and Co. Ltd., 578 Bourke-street, Melbourne
Ward's Barley Hulls	2.0	0.8	32.0	H. S. K. Ward Pty. Ltd., 24-38 Spencer-street, Melbourne
McKenzie's Pea Hulls	6.0	0.5	40.0	J. F. McKenzie and Co. Pty. Ltd., 74 Queensbridge-street, South Melbourne
Parsons' Pea Hulls	3.5	0.4	46.25	Parsons Bros. and Co. Pty. Ltd., 554-562 Flinders-lane, Melbourne
Ward's Pea Hulls	5.0	0.25	40.0	H. S. K. Ward Pty. Ltd., 24-38 Spencer-street, Melbourne
Parsons' Oat Hulls (A)	1.25	0.4	40.75	Parsons Bros. and Co. Pty. Ltd., 554-562 Flinders-lane, Melbourne
Parsons' Oat Hulls (B)	4.25	3.0	30.0	Parsons Bros. and Co. Pty. Ltd., 554-562 Flinders-lane, Melbourne
Parsons' Oat Hulls (C)	5.0	1.25	34.0	Parsons Bros. and Co. Pty. Ltd., 554-562 Flinders-lane, Melbourne
Ward's Oat Hulls	1.5	0.7	35.0	H. S. K. Ward Pty. Ltd., 24-38 Spencer-street, Melbourne
Connell's Oat Hulls	0.5	0.5	35.0	John Connell and Co. Ltd., 578 Bourke-street, Melbourne

"Cuprox" Fungicide

GREATER YIELD



When Crops are *Fungus Free*

Spray with "Cuprox" copper fungicidal spray and control fungous diseases of fruit, vine and vegetable crops. "Cuprox" — the modern replacement for Bordeaux mixture — is available in economical powder form ready for immediate use. There's no waste, fuss or bother with "Cuprox" — just add to water and stir. The mixed spray lasts indefinitely.

"Cuprox" wets and spreads well. It can be used safely with lead arsenate, nicotine, derris, oils, sulphur, lime sulphur, and D.D.T. sprays.

"Cuprox"
Regd. Trade Mark

**COPPER
FUNGICIDAL SPRAY**



DEPENDABLE
PLANT
PROTECTION
PRODUCTS

Vic. Dist.:
RAMSAY &
TREGANOWAN LTD.

IPP-D24

DEATH TO FRUIT TREE PARASITES

DDEATH SPRAY 20% DDT Emulsion

IN THIS PREPARATION D.D.T. IS INSOLUBLE IN WATER, AND CONSEQUENTLY IS UNAFFECTED, NOR DOES IT HAVE TO BE RE-APPLIED AFTER HEAVY RAIN.

Effective in Horticultural, Agricultural and Pastoral Fields
PARTICULARLY VALUABLE FOR ORCHARDISTS

SOLD IN—5 gallon and 44 gallon drum lots
1 gallon to 199 gallons water for 0.1% spray

Also DDEATH for Poultry Parasites
DDEATH for Dairying Industry

DDEATH is obtainable in the following Country Centres:—

- ARARAT: Harrison & Co., Barkly-street. Phone 53.
 AVOCA: Iles, Golder. Phone 95.
 BAIRNSDALE: C. C. Oakley, 105 Main-street. Phone 70.
 BAYSWATER: G. B. Calderwood, Elmhurst-road.
 BENALLA: J. L. Clark, Carrier-street.
 BENDIGO: W. F. Walters, 37 Wills-street. Phone 983.
 R. L. Hovenden, 216 Mitchell-street. Bendigo 1337.
 BENTLEIGH and CHELTENHAM: Charles J. Parnham, corner Centre and Jasper roads. Phone XU1118.
 BERRIWILLOCK: B. Harley, P.O. Box 36.
 BET BET: E. T. Brooker. Phone P.O.
 BIRCHIP: C. Clover, Watson's-road.
 CARISBROOK: W. K. Keenan. Phone 262.
 CASTLEMAINE: W. J. Stoneman, merchant.
 CHARLTON: Chas. O. Rowland, High-street.
 COPE COPE: W. Hodgson & Co. Pty. Ltd.
 COROWA: C. R. Reade.
 CROYDON: Eastern Egg Producers' Co-op. Soc. Ltd., Main-street, Croydon. 286.
 DANDENONG: John F. Goulding, 12 Lonsdale-street, Dandenong. 147.
 DENILQUIN: J. G. McFarrell, Napier-street.
 DIMBOOLA: O. W. Jochinke Pty. Ltd., Wimmera-street. Phone 16.
 DONALD: A. Hines.
 DUNOLLY: P. J. Daly. Phone 35.
 ECHUCA: F. W. Young & Co., 240 Hare-street. EchUCA 95.
 ELTHAM: W. K. Carroll, Hillcrest-avenue.
 EUROA: G. A. Gardiner. Box 46, P.O.
 FRANKSTON: Messrs. Butt & Gardiner, Beach-street. Phone 69.
 GREENSBOROUGH: A. J. & N. Gee, Main-street. Phone 52.
 HAMILTON: Hamilton Farmers' Supply Co. Ltd. Phone 219.
 HARCOURT: Harcourt Fruit Growers' Progress Assn.
 HEATHCOTE: W. A. Cary.
 INGLEDOW: R. & T. Jennings, Brooke-street. Phone 1.
 KAMAROOKA, via Raywood: A. J. Aitken.
 LAANECORIE: G. A. & V. F. Olsen.
 LILYDALE: T. Mitchell, estate agent, Main-street. Lilydale 140.
 MALDON: R. V. London, Main-street.
 MALMSBURY: J. S. Hoopell. Phone 6.
 MARNOO: T. P. Barnham. Phone 2.
 MARYBOROUGH: Joseph Elliott & Sons Ltd. Phone 124.
 MILDURA: Dixon's Mildura Markets Pty. Ltd., 74 Orange-avenue. Mildura 162.
 MURCHISON: J. G. Kenny, Railway Station. Phone 66.
 MURTOA: H. E. Martin, Lloyd-street.
 NAGAMBIE: G. A. Phipps. Phone 102.
 NATHALIA: E. Cowper. Box 18.
 NATTE YALLOCK: Geo. Crothers.
 NEWSTEAD: Newstead Co-op. Butter & Cheese Factory Ltd. Phone 1.
 NHILL: A. R. Bethke, Woorak, via Kiata.
 OAKLEIGH: Jackson's Service Station, Dandenong-road (next to Egg Board Floor). UM1771.
 PYRAMID HILL: Pyramid Co-op. Society Ltd., Kelly-street. Phones 2 and 18.
 PORTLAND: Portland & Heywood District Suppliers, 131-135 Percy-street. Portland 221.
 RAYWOOD: A. L. Martin, General Store.
 REDCLIFFS: S. A. Donaghy, Indie-avenue. Redcliff 424.
 RIVERINA AREA—WAGGA.
 TEMORA: Riverina Cool Stores. Phone Temora 129.
 ROCHESTER: W. F. Allgood.
 ROSEBUD: H. B. Adams, Pt. Nepean-road. Box 264.
 RUPANYUP: L. Simpsons Pty. Ltd. Phone 3.
 RUSHWORTH: A. J. Sleep. Phone 101.
 SALE: Gordon J. Roderick, 66 McAllister-street.
 STAWELL: T. A. Prydderch, Main-street. Phone 37.
 SPRINGVALE: J. A. Andrew & Sons, 66 Springvale-road. UM9242. H. I. Slater, Springvale-road. UM9252.
 ST. ARNAUD: J. W. Pickthall, 4 Silvermines-road. Phone 248.
 TEMPLESTOWE: Fred. Chivers.
 TERANG: W. J. McLaren, 2 Baynes-street.
 TRAFALGAR: G. V. Ford, Box 60, P.O. Phone 14.
 TRENTHAM: S. Dockendorff. Phone 276.
 TUNGAMAH: F. W. Fox & Co. P.O. Box 14. Phone 5.
 WANGARATTA: Norman A. Comrie, 66 Murphy-street. Wangaratta 6.
 WARRACKNABEAL: H. Rodda. P.O. Box 254.
 WARRAGUL: Bloomfield Co-op. Butter & Cheese Factory. Phone 1.
 WERRIBEE: S. C. & E. Thompson Bros., Cherry-street. Werribee 91 and 23. Melbourne Stores Pty. Ltd., Watton-street. Werribee 130.
 WEDDERBURN: Wm. Cashen & Sons, High-street. Phone 49.
 WODONGA: S. K. Parker. Phone 80.
 YAAPEET: Lance C. Fisher, Byrne-street.

FURTHER AGENTS WELCOMED

For Particulars Apply: CHEMICAL DIVISION,
J. D. HARMSWORTH & Co. Pty. Ltd.
 185 WILLIAM STREET, C.1 'Phone MU 3363

LIST OF STOCK FOODS AND STOCK LICKS—continued.

Distinguishing Brand Name.	Guaranteed Composition.			Where Obtainable.
	Crude Protein (N x 6.25). Minimum.	Crude Fat. Minimum.	Crude Fibre. Maximum.	
HULLS—continued.				
	%	%	%	
Harper's Oat Hulls	1.0	0.75	35.0	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
McKenzie's Oat Hulls	1.5	1.0	35.0	J. F. McKenzie and Co. Pty. Ltd., 74 Queensbridge-street, South Melbourne
Creamota Oat Hulls	2.0	1.0	32.5	Creamota Ltd., Sunshine-road, West Footscray
T.B. and S. Oat Hulls	1.5	0.4	40.0	T. Borthwick and Sons (A/asia) Ltd., 84 William-street, Melbourne
Lanray Oat Hulls	1.25	0.4	40.75	Lanray Milling Co. Pty. Ltd., 131 Queen-street, Melbourne
Creamota Barley Hulls	9.75	8.35	12.81	Creamota Ltd., Sunshine-road, West Footscray
Lanray Barley Hulls	2.5	0.6	40.0	Lanray Milling Co. Pty. Ltd., 131 Queen-street, Melbourne
A.B.C. Oat Hulls	1.5	0.7	35.0	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
MISCELLANEOUS.				
Lucerne Meal	13.0	3.0	25.0	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
Lupol	9.5	1.0	36.0	E. C. Robertson Pty. Ltd., 527 Collins-street, Melbourne
Biscuit Sweepings	2.0	2.0	2.0	Swallow and Ariell Ltd., 60 Stokes-street, Port Melbourne
Bakehouse Sweepings	2.0	2.0	2.0	Swallow and Ariell Ltd., 60 Stokes-street, Port Melbourne
V.V.C. Milo Meal	7.9	2.6	1.8	Victorian Wheatgrowers Corp. Ltd., 17 Queen-street, Melbourne
F.P.C. Flax Meal	16.0	14.0	15.0	Flax Production Committee, 440 Little Collins-street, Melbourne
F.P.C. Crushed Flax Chaff	11.0	6.0	28.0	Flax Production Committee, 440 Little Collins-street, Melbourne

VITAMIN OILS.

Distinguishing Brand Name.	Guaranteed Composition. (In International Units per gram.)		Where Obtainable.
	Vitamin A. (Minimum.)	Vitamin D. (Minimum.)	
Sol-Vit-Ax Cod Liver Oil	500	50	G. P. Embleton and Co. Pty. Ltd., 208 Little Lonsdale-street, Melbourne
Unifed Double Vitaminised Blended Feeding Oil	1,500	200	Atlantic Union Oil Co. Ltd., 396 Collins-street, Melbourne
Empress Vitaminized Oil	1,000	100	G. P. Embleton and Co. Pty. Ltd., 208 Little Lonsdale-street, Melbourne
Vetemul Blue Label Vitaminized Emulsion	5,000	Nil	Nicholas Pty. Ltd., 37 Swanston-street, Melbourne
Vetemul Green Label Vitaminized Emulsion	5,000	500	Nicholas Pty. Ltd., 37 Swanston-street, Melbourne
Vetemul Brown Label Vitaminized Emulsion	1,000	100	Nicholas Pty. Ltd., 37 Swanston-street, Melbourne
Apsolene 2,500	2,500	Nil	Australian Packers' Corp. Pty. Ltd., 414 Collins-street, Melbourne
Apsolene	5,000	Nil	Australian Packers' Corp. Pty. Ltd., 414 Collins-street, Melbourne
Apsolene 2,500 A.D.	2,500	250	Australian Packers' Corp. Pty. Ltd., 414 Collins-street, Melbourne
Apsolene A.D.	5,000	500	Australian Packers' Corp. Pty. Ltd., 414 Collins-street, Melbourne
Ocean Gold Vitaminized Oil	2,500	Nil	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Deaol	1,000	400	Australian Packers' Corp. Pty. Ltd., 414 Collins-street, Melbourne
Seaol	1,000	100	Australian Packers' Corp. Pty. Ltd., 414 Collins-street, Melbourne
Ava No. 1 Vitaminised Oil Emulsion	2,500	Nil	A. A. Emulsion Co. Pty. Ltd., 55 Hobson's-road, South Kensington
Ava No. 2 Vitaminised Oil Emulsion	2,500	200	A. A. Emulsion Co. Pty. Ltd., 55 Hobson's-road, South Kensington

LIST OF STOCK FOODS AND STOCK LICKS—continued.

STOCK LICKS.

Distinguishing Brand Name.	Guaranteed Composition.							Where Obtainable.
	Salt.	Phos- phoric Acid.	Lime.	Mag- nesia.	Iron (as Fe ₂ O ₃).	Sulphur.	Iodine.	
STOCK LICKS.	% (Max.)	% (Min.)	% (Min.)	% (Min.)	% (Min.)	% (Min.)	% (Min.)	
<i>Common Salt.</i>								
Hart's Roklik	100.0	..	..	..	..	..	..	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Lepp Salt Lick	100.0	..	..	..	..	..	..	J. S. Corden and Co. (Vic.) Pty. Ltd., 44-54 Spencer-street, Melbourne
Ram Salt Lick	100.0	..	..	..	..	..	..	Cheetham Salt Pty. Ltd., 71 Little Malop-street, Geelong
Ramlic	97.0	..	..	..	..	3.0	..	Cheetham Salt Pty. Ltd., 71 Little Malop-street, Geelong
Hart's Iodised Block Lick ..	99.0	..	..	..	0.5	..	Trace	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Hart's Sulphurised Block Lick	98.0	..	..	..	..	2.0	..	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Allkon Iodised Block Lick ..	99.0	..	..	..	0.5	..	Trace	Allkon Pty. Ltd., 36 Clarendon- street, South Melbourne
Allkon Roklik	100.0	..	..	..	..	..	..	Allkon Pty. Ltd., 36 Clarendon- street, South Melbourne
Allkon Sulphurised Block Lick	98.0	..	..	..	..	2.0	..	Allkon Pty. Ltd., 36 Clarendon- street, South Melbourne
<i>Bone Meal, &c.</i>								
Apex Sterilized Bone Meal ..	..	24.0	28.0	..	..	..	..	North-Eastern Bone Products, Wan- garatta
Cockbill's Bone Meal	..	21.76	27.6	..	..	..	..	J. Cockbill, Footscray-road, Foot- scray
Tricalos Sterilized Bone Flour	..	32.5	40.0	..	..	..	..	Glues and By-Products Pty. Ltd., 86 King-street, Melbourne
Cockbill's Bone Grit	..	20.0	25.27	..	..	..	..	J. Cockbill, Footscray-road, Foot- scray
Pannifex Bone Meal	..	22.0	26.0	..	..	..	..	H. C. Pannifex and Co. Pty. Ltd., 53-57 Munster-terrace, North Melbourne
D.B.G. Bone Meal	..	28.0	36.0	..	..	..	..	W. Angliss and Co. (Aust.) Pty. Ltd., 42 Bourke-street, Melbourne
Sickle in Diamond Dicalcie Phosphate	..	37.5	29.6	..	..	..	..	Commonwealth Fertilizers and Chemicals Ltd., 65 William- street, Melbourne
Fargher's Calcium Lick	..	4.5	65.0	..	..	..	..	W. J. Fargher, 610 Ligar-street, Ballarat
<i>MIXED STOCK LICKS.</i>								
<i>Non Salt.</i>								
Cobaltised Concentrated Vic-Lic*	..	24.0	29.9	..	5.8	..	Trace	Wilcox, Moillin Ltd., 34 King-street, Melbourne
Vic-Lic D Concentrated Sheep Lick	..	24.0	29.9	..	2.9	..	Trace	Wilcox, Moillin Ltd., 34 King-street, Melbourne
Vic-Lic G Concentrated Sheep Lick	..	24.0	29.9	..	5.8	..	Trace	Wilcox, Moillin Ltd., 34 King-street, Melbourne
Vita-Lick Concentrated D ..	..	23.5	30.0	..	1.3	2.0	Trace	Goldsbrough, Mort, and Co. Ltd., 526 Bourke-street, Melbourne
Vita-Lick Concentrated G ..	..	23.5	31.0	..	3.5	4.0	Trace	Goldsbrough, Mort, and Co. Ltd., 526 Bourke-street, Melbourne
Vita-Lick Cattle Concentrated G	..	25.0	32.5	..	4.7	1.15	Trace	Goldsbrough, Mort, and Co. Ltd., 526 Bourke-street, Melbourne
Vita-Lick Cobaltised Concen- trated G*	..	23.5	31.0	..	3.5	4.0	Trace	Goldsbrough, Mort, and Co. Ltd., 526 Bourke-street, Melbourne
Vita-Lick Cattle Concentrated D	..	21.2	29.0	..	3.4	0.4	Trace	Goldsbrough, Mort, and Co. Ltd., 526 Bourke-street, Melbourne
Vita-Lick Cobaltised Concen- trated D*	..	23.5	30.0	..	1.3	2.0	Trace	Goldsbrough, Mort, and Co. Ltd., 526 Bourke-street, Melbourne
Vetsolick Mineral Concentrate	..	11.0	14.0	0.7	1.5	16.6	Trace	A. H. McDonald, 627 Bridge-road, Richmond
Eureka Poultry Minerals ..	..	2.1	4.4	0.1	0.1	0.25	Trace	Eureka Mineral Poultry Foods, 14 Chesterville-road, Cheltenham
Minalick Concentrate	..	15.5	22.0	5.0	1.8	1.8	..	Standard Stock Service Co., 386 Flinders-lane, Melbourne
<i>Long Salt.</i>								
Allkon Concentrate	8.0	19.0	30.0	..	1.0	..	Trace	Allkon Pty. Ltd., 36 Clarendon- street, South Melbourne
Vic-Lic Concentrated Cattle Lick	5.5	23.0	29.0	..	2.9	..	Trace	Wilcox, Moillin Ltd., 34 King-street, Melbourne
Immunolic Concentrate	8.0	19.0	30.0	..	1.0	..	Trace	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne

* Contains trace of cobalt.

[Continued on page 336]

CERTIFIED PULLORUM-TESTED FLOCKS (POULTRY)

A certified Pullorum-Tested Flock is one in which all stock over six months of age have given a negative reaction to the agglutination test for Pullorum Disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector.

The undermentioned flocks have been certified by the Department of Agriculture, and will remain so for the current calendar year, or until such time as the Chief Veterinary Inspector determines.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Particulars of breeds of birds tested are as shown hereunder:—

A. Australorp; B. White Leghorn; C. Rhode Island Red; D. Sussex; E. Langshan;
F. Brown Leghorn; G. Buff Orpington; H. Black Leghorn; I. Minorca.

Owner.	Breed.	Number of Birds.	Owner.	Breed.	Number of Birds.
Agricultural College, Dookie	A, B	2,120	Harrison, A. (Mrs.), Shenfield-street, Cobden ..	A, B	247
Anderson, J. G., Greensborough-road, Macleod ..	A	1,409	Hayes Bros., Mt. Dandenong-road, Montrose ..	A, B	2,651
Anguey, H., Hargraves-street, Castlemaine ..	A	775	Hemphill, A. E., Monegetta	A, B	522
Arnold, J. B., Terrara-road, Vermont ..	A	713	Henderson, C. W., "Clifton," Shepparton ..	A	462
Ashgrove Stud Poultry Farm, Cockatoo ..	A, B, C	4,427	East		
	D, E		Henderson, W. R., 22 Chesterville-road, ..	A, I	228
Avonlea Poultry Farm, Stanhope	A, B	3,981	Cheltenham		
Baker, J. V., Albion-crescent, Greensborough ..	A	699	Hewett, A., Central-avenue, Bayswater ..	B, C	1,415
Bantick, K., Old Dandenong-road, Heather- ..	A, B	2,375	Hewitt's Poultry Farm, Skene-street, Bendigo ..	A, B, C	1,374
ton			Hines, B., Box 80, Donald	B	425
Barastoe Experimental Farm, P.O., Croydon ..	A, B	1,376	Hooker, E. L. (Mrs.), Corner Heatherston and ..	A, B, C	957
Bartlett, N. M., Pimino	A, B	264	Westall roads, Springvale		
Bastin, W., Banbury-road, Reservoir	A, B	1,278	Howard, A. P., Brookville, Kyneton	A, B	1,273
Batey, R. F., Invergordon South, via Tally- ..	A	1,599	Hunt, R. R., 365 Highbury-road, Burwood ..	A, B	1,197
garoopna			Hurst, B. H. G. (Mrs.), New-street, Eltham ..	B	1,636
Bayfield, A. B., Westall-road, Spring Vale ..	B, C	1,381			
Billman, J. H., Skene-street, Bendigo ..	A, B, C	742	Inglis, W., Cobham-road, Mitcham	A, B	459
Bingley, A., 333 Highbury-road, Burwood ..	A, B	2,062			
Bishop, P. M. (Mrs.), Springvale-road Spring- ..	A, B, C	1,601	Jackson, E. M. (Miss), 4 Monash-street, Box ..	B	52
vale South			Hill		
Boyce, A. D., Springvale-road, Forest Hill ..	B	2,139	Jenkins, A. E., Pen-y-bryn, Kallista	C	1,076
Bray, J., 18 Hotham-street, Warrnambool ..	B	96	Johnson, A. S., Burwood-road, Lower Fern- ..	A, B, C	2,424
Brumby, W. E., Ellendale-road, Noble Park ..	A, C	402	tree Gully		
Calder, R. A., Langwarrin	A, B	1,135	Kay, V., 12 Wellington-avenue, Blackburn ..	B	2,776
Canning, P. G., Shepparton East	B	3,974	Kemp, H. L., Whitehorse-road, Ringwood ..	A, B, C, D	2,465
Cashin's Poultry Farm, Stawell	A, B	3,860	Kerr, J. J., Clarke-road, Springvale	A, B	2,319
Clements, Wm. H., 7 Crown-road, Ivanhoe, ..	B, C	60			
N.21					
Coakes, G., Central-avenue Bayswater	B	352	Lang, J., 46 Dundas-street, Thornbury	E	124
Colquhoun, W. L., "Aringa," Ringwood ..	A, B	146	Lawson, A. J., Box 167, Horsham	A, B	416
Corbett Bros., Torbay-road, Macleod	A	2,458	Lintermans, Messrs. W. A. J. and Son, Major- ..	C	879
Crowle, L. Z., "Monomeeth," Broadford ..	A, B	900	road, Lysterfield		
Davey, A. R., Sellars-street, Greensborough ..	A, B	1,271	Lonie, R. A., 1 Chanak-avenue, East Malvern, ..	B	38
Davidson and O'Keefe, 22 Sherbrook-Avenue, ..	A, B	144	S.E.5		
Ringwood					
Davies, L. F., off Westall-road, Springvale ..	B, C	2,198	Longerenong College, Doon	B	372
Dawson, R., Maldon-road, Castlemaine ..	B	1,586	Lucas, G., 4 Downing-street, Blackburn ..	A, B	1,967
Day, L., Kyvalley	A, B, C	1,717			
Dent, A. T., "Ridgeway," Sellars-street, ..	A, B	1,178	Magnusson, L., Nathalia	B	952
Greensborough			Maier, Allan E., "Alendale," Wal Wal ..	B	748
Dobson, C. W., Whittlesea	C	108	Major, C. D., Simpson's-road, Eaglehawk ..	A, B	2,021
Dyson, F., Post Office, Mooroopna	A, B, C	744	Marshman, A. R., Archies Creek	A, B, C	936
			Mayne, N., Brandy Creek-road Warragul ..	A, B	77
			McErval, P. A., Kingclare Poultry Farm, ..	A, B	2,874
Emmott, J. T., Verdon-street, Inglewood ..	A, B, C	314	Boronia-road, Vermont		
Everard, H. L., Hawkesdale	A, B, C	924	Meier, C. G., "Bylands," Sydney-road, Kil- ..	A, D	40
Fellows, J., Yan Yean-road, Plenty	A, B, C	521	more		
Ford, J. V., 11 Barkers-avenue, Shepparton ..	A, B, C	997	Merrett, A. W., Albert-street, Sebastopol ..	A, B, C	239
Fraser, R. A., Colchester-road, Kilsyth ..	A, B, C	1,185	Milligan, V. R., State School, Ballendella ..	B	35
Frye, I. H., Grimshaw-road, Watsonia ..	A, B	1,996	Miller, Messrs T. and Son, Austin-crescent, ..	A, B, E	2,800
Fullerton, G. H., 57 Just Point, Long Gully, ..	A, B, C	344	Pascoe Vale		
Bendigo			Molson's White Leghorn Stud, (H. Durkin, ..	B	1,089
			Manager), 188 Surrey-road, Blackburn ..		
Gedye Bros., Railway-road, Blackburn ..	A, B	4,594	Monsant, J., Malden Gully, via Bendigo ..	A	1,557
Giarrusso, G., Braeside	B	801	Moore, H. A., Warrandyte-road, Ringwood ..	A, B	1,062
Graham, C., "All Black Poultry Farm," ..	A	60	North		
Portarlinton			Moroney, J. B., Kangaroo Flat	A, B	1,670
Grosvenor, E. W., and E. K., "The Haven ..	A, B, C	566	Mumford, L. J., Healesville	A	393
Poultry Farm," Springvale			McCabe, R., Gladstone-road, Dandenong ..	A, B	2,168
Guy, C. J., "Murlea," Murghebolisc ..	A, B, C	557	McCann, Messrs. R. and Son, Crowlands-road, ..	B	3,456
Gwyther, R. P., Highton	B	1,220	McLaren, A. D., Mooroopna	A, B, C	369
			McLauchlan, D. F., Rossiter-road, Koo-wee- ..	A, B	2,147
			rup		
Hall, R. H., Wal Wal	A, B	857	McVay, A. Kernot-street, West Footscray ..	A, B	2,681
Hall, W. S., Cairns-road, Lyndhurst ..	A, B, C	1,081			
Hamilton, A., "Lyncroft," Flinders	B	850	Niewand, F. J., "Kalang," Lubeck	A, B, C	1,556
Hamilton, W. J., Wood-street, Stawell ..	A, B	945			
Hanson, S. H., Box 7, Kilmore	A	206	Overman, V. C., Vernal-avenue, Mitcham ..	A, B	1,944
			Owen, H. T., Chum-road, Healesville	B	296

CERTIFIED PULLORUM-TESTED FLOCKS (POULTRY)—continued.

Owner.	Breed.	Number of Birds.	Owner.	Breed.	Number of Birds.
Paton, W. S., Glenburnie-road, Mitcham ..	A B	626	Stewart, J. A., Maldon-road, Castlemaine ..	A, B	520
Poulton, A. W., Vickers-street, Sebastopol ..	A, B	1,875	Stewart, P. D., Bayswater-road, Croydon ..	A, B	987
Rae, J., 277 Albert-street, Sebastopol, Ballarat	A, B, C	1,679	Stiles Bros., "Fairview," Wallan ..	B	871
Reher, F. L., Temple-street, Burwood	A, B, C	2,219	Streeter, H. A., Avoca ..	B	544
Robinson W., 11 Olive-street, Hampton, S.7	C	471	Success Poultry Farm, 13 Knight-street, Shepparton	A, B, C	1,362
Rosebank Poultry Farm, 119 Rathgowan-road, Reservoir. (H. Taylor, proprietor.)	A, B, C	3171	Swift, D. A., Kangaroo Flat ..	A, B	2,468
Rossmoyne Poultry Farm, Box 38, Avoca ..	A, B	1,781	Thompson, G., Westell-road, Springvale ..	A, B	1,618
Salmond, J. B., Deer Park ..	H	230	Voight, A. H., Pollett-road, Cheltenham ..	A, B	1,154
San Miguel, A. S., Woodhouse-grove, Box Hill	A, B	2,210	Waiting, T. F., Bayswater ..	A, B	300
Scales, J., West Wattletree-road, Boronia ..	A	1,382	Wakeham, W. M., 20 Frederick-street, Heidelberg	A, C	50
Schulze, Mrs. C. A., Box 52, Dimboola ..	A, B	200	Walton, F. R., Woodvale-road, Boronia ..	A, C	724
Scouler, R. C., Tarrant-street, Cobden ..	A, B	489	Wandong Poultry Farm, Lawn-road, Noble Park	A, B	1,284
Settle, J. H., Stanhope ..	A, B, C	1,484	Wanliss, W. J., Springvale South ..	A, B	1,882
Simmons, J. T., 6 Lindsay-avenue, Murrumbidgee	B	29	Watson, W. K., Greenvale-road, Somerton ..	A, B	860
Simpson, G. D., May-road, Glen Waverly ..	B	7,106	Waugh, A. J., Kangaroo Flat ..	A, B	1,202
Smith, A. H., Marong-road, Maiden Gully ..	A, B, C	1,100	Welsh, T. A., Bayswater-road, Croydon ..	A, B	4,512
Smith, W. T., and F. W., Panton Hills	A, B	1,832	Wernli, J. H., Wilson-street, Cheltenham ..	A, B, D	1,535
Stant, Messrs. W. J. and F. E., Spring Vale	A, B, C	3,996	Wesley, J. H., Kangaroo Flat ..	A, B, C	1,910
State Research Farm, Werribee ..	A, B	903	Wilkinson, L., McKenzie-road, Golden Square	A, B	369
Statham, S. B., 16 Inglewood-road, St. Arnaud	A	688	Winter, G., "Denehurst," Murgheboluc ..	A, C	470
			Wohlars, S., Box 17, Jung ..	A	300
			Wright, D. B., South-avenue, Mt. Evelyn ..	C	64

LIST OF STOCK FOODS AND STOCK LICKS (continued from page 334).

STOCK LICKS—continued.

Distinguishing Brand Name.	Guaranteed Composition.							Where Obtainable.
	Salt.	Phosphoric Acid.	Lime.	Magnesia.	Iron (as Fe ₂ O ₃).	Sulphur.	Iodine.	
	(%)	(Min.)	(Min.)	(Min.)	(Min.)	(Min.)	(Min.)	
MIXED STOCK LICKS—continued.								
<i>Medium Salt.</i>								
Rudduck's Improved ..	22.2	11.3	20.3	0.6	0.6	2.4	Trace	Rudduck and Co. Pty. Ltd., 556 Lonsdale-street, Melbourne
<i>High Salt.</i>								
Vetamac Medicated ..	53.0	5.7	7.5	Trace	0.7	4.0	Trace	A. H. McDonald, 627 Bridge-road, Richmond
Hart's Block Lick ..	91.0	1.9	3.0	..	..	..	..	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Allkon Block Lick ..	91.0	1.9	3.0	..	..	..	..	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne
Salvitris No. 1 ..	90.0	1.8	2.5	0.2	0.8	0.4	Trace	Cheetham Salt Pty. Ltd., 71 Little Malop-street, Geelong
Salvitris No. 2 ..	70.0	7.1	8.8	0.2	0.8	4.0	Trace	Cheetham Salt Pty. Ltd., 71 Little Malop-street, Geelong
Hart's Cobalt Block Lick† ..	91.0	1.9	3.0	..	..	..	..	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
<i>Lime Licks.</i>								
Allkon Organic Lime Compound ..	..	..	7.0	..	..	..	..	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne
Hart's Immuno! Organic Lime Compound ..	..	..	7.0	..	..	..	..	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Hart's Immuno! Special Organic Lime Compound ..	..	..	7.0	..	..	..	..	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Allkon Special Organic Lime Compound ..	..	..	7.0	..	..	..	..	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne

† Contains traces of cobalt and copper.

Melbourne, 20th April, 1948.

W. R. JEWELL, M.Sc.,
Chemist for Agriculture.

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The Progressive Development of Victorian Agriculture

An Address given by Mr. H. A. Mullett, B.Agr.Sc., Director of Agriculture, at the 43rd Annual Convention of the Chamber of Agriculture, held at Bendigo.

"Let us resolve to increase the production of food for Britain during this abnormal period by the only course that appears open to us; that is to say, by vigorous individual effort. Let us also co-operate in a long-range scientific plan to lift the production of our live stock to new and higher levels."

THERE was a time in the history of this State when producers of food-stuffs were looked upon, not so much as the providers of that substance without which life and health cannot be sustained nor work performed, but rather as a group too often presenting some kind of economic burden for the rest of the community to shoulder. In that period, when anybody wanted to stress the importance of agriculture to the community, it was necessary to fall back on the stock argument that 95 per cent. of the exportable wealth of this country was primary produce, and to stress the fact that without these exports it would not be possible to pay for our imports and other overseas commitments.

At that time it was of no use emphasizing the important function performed by our primary producers of feeding one and a half millions of people here as well as some millions in Britain, because no one was interested in that phase of agriculture. It was taken for granted that adequate supplies of food would be forthcoming; just as the city dweller to-day takes it for granted that fresh water will flow from the tap on the Yan Yean system.

This point of view prevailed, largely unaltered, through the first world war; indeed, it was intensified by the great world slump in prices which followed some ten years later. It has taken a total war of the catastrophic destructive power of the second world war, and the need for Australia to supply much of the food for a

million U.S.A. troops, as well as her own armies, while continuing her exports to Britain, to alter that point of view.

The production of foodstuffs is seen now, by almost everybody, to be important, because of the intrinsic usefulness of food itself as a means of supporting human life. Its function in increasing the wealth of this country takes a secondary place.

No doubt food rationing has played some part in this altered outlook, but possibly more because of the inconvenience caused than from any actual hardship imposed. Our military needs during the war first made us food conscious, but surely it is the need of the mother country at the present time which keeps that feeling alive.

BRITAIN'S NEED

Britain is short of food, but the defect lies not so much in the total energy value of the food supplied to the population as in its monotony. I personally experienced this diet for three weeks in London in 1946, and can only say that, according to Australian standards, it is most dreary and unsatisfactory. However, it might be well to look at this matter a little more closely and compare scientifically the energy value of the food consumed in Great Britain and in various other countries including Australia, both before the war and now.

To do this you must have an exact standard of measurement. The one used by dietitians for this purpose is the calorie.

A calorie is, in fact, the amount of heat produced by burning one gramme of the foodstuff, that is to say, about $\frac{1}{28}$ of an oz. There is a most accurate method of doing this, and standard tables are available enabling the energy values of all foodstuffs to be compared. We slowly burn food in our bodies and that is how we get the energy from food. Hence the calorific value of a dietary, with appropriate corrections, is a measure of its energy-producing value to human beings. Of course, it does not tell us anything about the other desirable qualities of a food, such as vitamin content, &c.: nevertheless, it is a most useful comparative figure.

The British Ministry of Food has carefully calculated the calorific value of the food consumed by the people of various countries during the three months, April, May, and June, 1946. This is set out in the following table:—

—	Calories.	Percentage of Pre-war Calorific Value.
		%
United States of America ..	3,100	100
Canada	3,000	100
Australia	3,000	97
United Kingdom	2,800-2,850	93-95
Belgium, France, Netherlands, and Norway	2,300-2,500	75-85
Austria, Czechoslovakia, Greece, and Italy	1,700-2,400	60-85
Germany	1,600-1,800	50-60

Nutritional levels below 2,000 calories for Europeans give only a minimum subsistence, so you can look upon the conditions in Germany and Central Europe as anything but good. In Britain, at the time the table was computed, however, they were still fairly good, but, since then, there has been a further reduction in the calorific value of the British ration, although not a considerable reduction.

The nutritional level of the peoples of India, China, and, in fact, of half the population of the world, is low, and is less than 2,250 calories per day. The Food and Agriculture Organization of the United Nations has investigated this latter problem most thoroughly and considers that, once the European problem is relieved,

the next great field of endeavour should be to raise the nutritional level of these under-nourished people, and hence their energy and general productivity. F.A.O. points out that, in these countries, the output of food per man is only one-tenth of what it is in countries like U.S.A. and Australia. F.A.O. holds the view that the only solution to this problem is to raise the efficiency of the peasant family by the use of more scientific methods and by a measure of mechanization on the farms. This would release labour for the development of secondary industries and so increase the purchasing power of these countries.

You might well ask, "What has all this to do with Victorian agriculture?" The answer is that the problem of producing more foodstuffs here to feed Great Britain is of first-class importance and in high priority. The problem of raising the level of nutrition of the under-developed countries of the world, which has occupied so much of the attention of the Food and Agriculture Organization is, I suggest, one that we are not able to cope with at present, though we recognize the desirability of doing this, and also that an increase in the productivity of these nations will, in the end, increase their purchasing power and so increase their capacity to buy from us.

BRITISH FOOD MISSION TO AUSTRALIA

The British Food Mission, which recently visited Australia to arrange for the purchase of more dairy produce, meat, and eggs, &c., advised us of Britain's need, and of her desire to stimulate production of these commodities in Australia.

Representatives of the Overseas Food Corporation were here also, and their mission on this occasion was primarily one of establishing in Queensland a vast enterprise in which large numbers of pigs will be raised and substantial quantities of sunflower seed will be grown for vegetable oil; both for export to Great Britain. This Corporation will have a capital of £100,000,000 provided by the British Government. Its charter is to set up outside Britain, but in the Empire, large commercial enterprises for the production of foodstuffs. The presence of these representatives of the British Government here shows that Britain is taking energetic action



Butter for Britain.

to meet her requirements. The members of the Mission consider that the shortages in the live-stock products are likely to go on for a considerable time, and that, for some years, we can look forward to an expanding market rather than a contracting one such as we began to experience just before the war. This is because the live-stock population of Europe will take some years to return to normal.

On the other hand, it is much easier to restore the world's cereal production so that the prospects in these latter industries for continuance of the present high level of export prices are not so good as for dairy produce, meat, and eggs. Nevertheless, when we look into the future beyond the date already written or to be written into these present contracts, or already guaranteed by the Commonwealth Government, it must be recognized that we look into the unknown.

If then we face serious competition on our export markets abroad, we will do so with the cost of production having been inflated by rising costs for everything the farmer purchases; for labour, materials, plant, and machinery. Our competitors may also be faced with rising costs to an extent we cannot assess here. In some

countries these costs may be more, and, in others, less than our own. Over these things the average farmer has little control. What then can be done about it? One prudent course open to us is, I suggest, to increase the yield of each acre, and each animal, and, at the same time, to improve the quality of our produce by means which have served us well in the past. Other countries are bound to be doing this also, but, in general, in most of them, yields of the animals are already so high that our own margin for improvement is far greater.

WHAT CAN WE DO TO INCREASE PRODUCTION?

There are two food problems; first, what can we do to increase our food supplies now and during the next two or three years; and what long-range policy must we pursue in developing the food-producing resources of this State, and so do our part in augmenting the food supplies of the world?

Unlike the under-developed countries I have referred to, we already possess considerable practical technical and scientific knowledge on how to increase production. Have we not, for example, raised the yield

of wheat by scientific breeding and improved methods, by 2 bushels per acre over the best part of 3 million acres; extra wheat worth more than £5,000,000 this year at world prices, wheat which would not have existed but for this work? Have we not increased the stock-carrying capacity by more than 50 per cent. over 4 million acres? Have we not brought millions of acres of light land of comparatively low production to a highly-productive state by the use of subterranean clover and super-phosphate? The irrigationist, too, has been shown how to grow some of the most productive pastures in the world.

Nor must we overlook the fact that these achievements have made possible the baling annually of some 360,000 tons of grass hay in the better rainfall districts and irrigation areas, a fodder which, for cheapness, nutritive value, and portability, has filled a great gap in our feeding programme. Our stock breeders have played their part in lifting the productivity of the various breeds of sheep, cattle, and pigs, and our veterinarians have reduced the incidence of disease in animals, and our plant-disease specialists in plants.

It would be beyond me to give you a catalogue of all the practical and scientific knowledge available on farms in this State and in the Department of Agriculture that could be used to increase the production of foodstuffs. You know that this knowledge is immense, and that, properly used, it could be a powerful instrument in quickly raising the production of foodstuffs.

STALEMATE!

Looking at the production figures for the live-stock industries, and making due allowance for the serious disturbance of the war and the setback due to the 1944-45 drought, my view is that there are undoubted signs of a stalemate except in the poultry industry where production doubled in the war and is still increasing.

The production in the pig industry, specially boosted in the war, has declined, and we know it is because the price offered is less attractive than for other forms of production.

In the dairying industry there is also some evidence of decline. Of course, people who want to alarm you point to the fall

from an average export of butter from Australia during the pre-war period, 1931-1936, from 100,000 tons to 56,000 tons for 1947, but such comparisons ignore the increase in the manufacture of condensed and dried milk, in cheese, and also the additional milk consumed in towns and cities.

The figures for total milk production give a far truer picture, and they do not indicate any alarming decrease, but at least they show a stalemate has developed, and we only need to look around to see the increase in beef cattle and sheep on dairy farms to realize what is happening. These things are controlled by the relative prices paid for the various products, labour supply, &c. Of course, the total sheep figures for the State show a drop of several millions due to the drought, but it is certain that this sheep deficiency will soon be rectified; but can the numbers then be lifted above the pre-drought figure?

Now the question is, why, after many years of steady progress in our live-stock industries, has this stalemate developed? It is, of course, related to shortages of labour, of materials, concrete, piping, tractors, machinery, wire and wire-netting, and general farm requisites, and to the sense of frustration at the difficulty of getting anything done in a reasonable time and at a reasonable price.

There are other special drawbacks to incentive that are peculiar to these times and all are the aftermath of the long period when the whole of the nation's effort was dedicated to war, and many things, such as housing, were left in abeyance. Of these you are well aware.

Once the real need of the British people for food is properly understood, I feel that the attitude of most practical people could be expressed something like this:—"I will not attach some disabling condition to my effort to produce more food, such as 'Let all these difficulties be swept away before I act'. Rather will I say, 'I will see what I can do by my own personal effort to increase production despite these hindrances'." Of course, if some of these difficulties can be removed, so much the better.

People in cities and towns can send gift parcels to Britain. These come out of the Australian ration, but, while they do not

do much to relieve the rationing problem of the British Ministry of Food, nevertheless they are much appreciated.

LET EACH FARMER SET HIS OWN TARGET

What Britain needs is an increase in the volume of produce under contract. Each primary producer can set a target for himself. A dairy farmer can say, "I will do something to raise the production of my herd and will bale more hay to feed my herd better. I will boost production by better feeding and by a little extra care and check this waste or eliminate that fault. I will fertilize an extra paddock this year". Pig men can rear a few more pigs and feed them better. Beef men can cut more grass hay in the spring and feed it in the autumn, and the fat-lamb producer can look over his ewes a little more carefully at lambing time, and so on.

If these things could be done and with a right good will, I am certain that our production barometer would begin to rise, and that we could get an extra ship-load or two of much-needed food to Britain; food for which we will be paid, but for which

our greater reward would be the satisfaction at each having made the effort personally of our own free will and without any help from anyone else.

SCIENCE AND LIVE STOCK PRODUCTION

I turn now to some long-range plans for improving the production of live stock. These seek to intensify the application of science to these industries. These plans should be applied early, so that the results will fructify when the present obstacles to expansion of production have disappeared. These plans require scientifically-trained personnel to carry them out. This personnel is exceedingly rare in Australia, and we have had to send four men this year to New Zealand to undertake the University course in Dairy Science at Massey College. Sixteen more will follow over the next four years. Our own state is capable of giving a University course in animal husbandry, and I am hopeful that this will be done shortly.

The possibilities for live-stock improvement by scientific means and for more production are considerable and the methods



Scientific breeding and improved cultural methods have played an important part in the development of the Victorian wheat industry.

vary. Let me give four brief illustrations, three relating to breeding and one to animal disease control.

Look for a moment at the figures for dairy production in Victoria. To smooth out seasonal effects it is better to compare averages in five-year periods:—

TABLE SHOWING AVERAGE DAIRY PRODUCTION IN FIVE-YEAR PERIODS.

Five-year Period.	Average Number Dairy Cows.	Average Milk Yield.	Average Milk Yield per Cow.
			gallons.
1921-25 ..	726,546	250,948	347
1926-30 ..	652,335	265,482	407
1931-35 ..	838,940	369,549	440
1936-40 ..	943,089	415,029	440
1941-45 ..	939,511	395,848	422
1946-47 .. (2 years)	919,393	404,935	439

These figures show that the average production per cow gradually reached a peak of about 440 gallons of milk per annum in the period 1931-35 and that we have not succeeded in raising it beyond that figure ever since.

Is this the limit for the State for all time or can we raise it? Certainly we can, because we know that many dairy farmers get higher yields than these and what they can do, others can do by using the right methods.

Let us look at the yields the cows in the Grade Herd Test are giving. To do that we must examine their butterfat records. The average annual yield of butterfat for the State for the five years ending June, 1947, was 180 lb. The average annual yield of 55,000 cows then under test in a corresponding five-year period was 240 lb. of butterfat.

These figures show that there is still room for improvement in State yields by the use of up-to-date methods. This will come about when the technique of improving production is adopted more widely. To bring this about, the lessons must be persistently presented to those producers whose yields are below average.

The average yields of Grade Herd Test cows have also been stationary for a number of years despite the fact that these Grade herds are now headed by pure bulls. How can we break these deadlocks? We can do it by two methods, one by feeding and the other by scientific breeding.

My officers estimate that, by cutting and feeding more grass hay, we could increase dairy production by 200 million gallons of milk, and that another 200 million gallons could be obtained by feeding 3 lb. of concentrates per day from mid-December to mid-September—if we could get the concentrates.



Adequate fodder reserves are essential to maintain production during the leaner periods of the year.



Dairy products rank high among Britain's food requirements.

The poultry industry is using much of the concentrates once fed to dairy cows. This emphasizes the need for a progressive vegetable oil crop production programme, a by-product of which is protein-rich concentrated meal.

THE VALUE OF PROVEN SIRES IN THE DAIRY INDUSTRY

But we must also break the deadlock on the breeding side. The problem is to find bulls that will really lift the production of our Grade herds. To do that we must use sires that have been proven to be able to lift the production of the average Grade herd. To lift the production of our stud herds we must use bulls that are proven also, but of even higher capacity. The bulls required are only found by a careful survey of the records of the daughters of the bull and comparing them with records of their dams. The Department has commenced this work, but it is a long job, and needs more technical staff than are so far available.

At the United States Department of Agriculture Animal Research Station, Beltsville, near Washington, I saw four dairy studs headed by proven sires—Friesians, Jerseys, Red Danish, Guernseys. The yields of each herd have been raised very substantially by the use of these sires.

In 25 years the yield of the Friesian stud has been raised from 672 lb. butterfat for 365 days to 856 lb. butterfat for the same period, and the yields of Jerseys from 632 lb. butterfat to 812 lb. butterfat. These cows have always been hand fed and the increase is mainly due to inheritance from a succession of sires proven to be able to lift the yield of butterfat in the herd to a still higher level than it was before.

There is a lesson in this for us. Once a bull has been proven by survey to be capable of lifting substantially the butterfat yield of a first-class herd, it is only prudent to make the best use of him. To do this, artificial insemination can be availed of, and his capacity multiplied from say 50 cows to up to 1,000 and more. The Department hopes to inaugurate such a service.

DISEASE CONTROL IN DAIRY HERDS

In this country, although pleuropneumonia is now practically negligible, tuberculosis in dairy cattle is still with us. Fortunately, it has an incidence of less than 3 per cent., but is very destructive. The Department has concentrated on the T.B. testing of cows supplying whole milk to the metropolis and the principal provincial cities. Eighty per cent. of the

herds supplying the metropolis have been tested, and the end of T.B. in whole milk is in sight. But T.B. in cows producing butterfat still costs the State £150,000 a year. Many States in U.S.A. have eliminated it altogether. It could be done here in twenty years. The cost would be in the vicinity of half a million pounds.

Contagious abortion of cattle is also costly to the dairy farmer. Strain 19 vaccine has reduced the incidence of this disease from 28 per cent. to 3 per cent. in first-calf heifers. Last year the Department vaccinated 70,000 calves. To step this up needs additional staff and funds.

PIG RAISING

The pig industry is something to which Denmark has applied concentrated scientific research. Important in bringing the Land-race pigs to their present high standard are the pig-recording stations. These test the gain in weight of sample pigs from litters of stud pigs, and enable breeders to select the boar with capacity to breed the most profitable pigs.

The establishment of such a station in this State has been approved and will be built when materials can be made available. Feeding experiments will also be made there.

SCIENTIFIC ASSISTANCE FOR THE POULTRY INDUSTRY

My last illustration deals with the poultry industry. The production from this industry in Victoria is worth £7,000,000 a

year. One of the real problems is the high proportion of eggs below first grade, especially from January until the new season's eggs are laid.

The British Government will not buy our eggs after 31st December each year—they find that they do not carry well.

This industry has its growing pains on the marketing side to which it is not my purpose to refer, but rather to the scientific assistance it needs. Bacterial rot of eggs is a preventable disease, the cause of which is known. What is necessary is the recognition that washing dirty eggs is the primary cause, and that the fouling of eggs is largely preventable.

Watery white, another cause of loss, is probably a hereditary factor which could be eliminated by proper selection of suitable strains. This work the Department will undertake.

Broken eggs are another source of loss. This is partly due to careless packing and partly to improper feeding, but there is also an hereditary factor here. The Americans have shown that you can select strains with thicker, tougher shells. This work the Department also hopes to do.

These are but a few of the illustrations that could be given of the practical aid that science can give the live-stock industries of Victoria. Success will be attained by the co-operation of all in giving to the live-stock industries a scientific service equal to, or even better than, that we now give plants.

Planting and Pruning Citrus Trees

Early spring is the best time for planting citrus trees. The soil usually contains sufficient moisture after the winter rains and, with the warmer weather at this time of the year, trees should quickly become established. In northern districts, hand watering of young trees is essential when the soil is dry. The success of a citrus plantation depends largely on healthy, vigorous growth during the early years.

Pruning should also be carried out in the spring. Regular pruning of citrus trees is not required, but, in some instances, it is necessary. If a tree is lacking in vigour, a thinning out of growth throughout the tree will probably result in a renewal of fresh fruiting wood.

Vigorously-growing young lemon trees sometimes require attention because they produce strong-growing vertical shoots which, if allowed to remain, would result in a badly-shaped tree, and a reduction in the more fruitful horizontally-growing shoots. These vertical shoots should be removed at their point of origin on the main branches.

Pruning should be delayed until the danger of severe frosts has passed, otherwise the young shoots may be damaged severely.

[Contributed by the Horticultural Division.]

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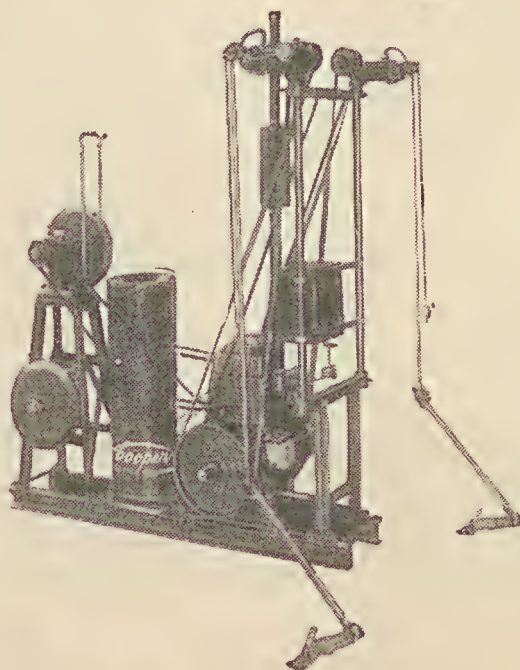
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Soil Fertility in the Orchard

By J. C. Walsh, B.Agr.Sc., Horticultural Instructor



A Bacchus Marsh apple orchard under sod.

HEALTHY growth in fruit trees is an indication that soil conditions and plant foods are satisfactory. Sound, healthy trees will give good yields, and, therefore, the main object in orchard management should be to keep trees healthy.

Fertility depends on the physical condition and amount of available plant foods in the soil. A soil is more than an aggregate of rock particles; organic matter is an important constituent. It supplies essential plant foods such as nitrogen, and has a most beneficial effect on soil structure. Probably the most important function of organic matter is that it aids in the formation of water-stable aggregates or crumbs which increase the porosity and permeability of a soil. It also absorbs and retains water to a greater degree than the mineral

content. Soils low in organic matter erode comparatively rapidly. Considering all aspects it is not too much to say that the productiveness of soils is largely proportional to the amount of organic matter present.

This does not mean that plants cannot be grown without organic matter, because we know that they can be grown in water culture on minerals only. Likewise it is possible to grow plants on organic matter only. However, the middle course is the economic one. It is necessary to add organic matter to a soil deficient in this material and to add minerals where a mineral deficiency exists.

Most Victorian orchard soils are deficient in organic matter and in some minerals. Cultural methods which stir up the surface soil cause loss of organic

matter. Under natural conditions surface plants supply most of the organic matter in the soil, but clean cultivation greatly reduces this plant growth. Therefore green-manure crops, which will be considered later, are essential in orchard management.

Soil organisms break down the vegetable residue into simpler substances that can be utilized by plants. Plant foods can be used only in solution, and the soil organisms, in breaking down plant remains, form liquids which dissolve some of the otherwise insoluble minerals, thus making them available to plants.

Many elements are necessary for plant growth, some in fairly big quantities, such as oxygen, carbon, nitrogen, phosphorus, potash, sulphur, magnesium, calcium; others, in small amounts—iron, manganese, boron; and still others, the merest traces of which are required, chlorine, iodine, zinc, and copper. While many elements are essential for plants, only certain ones are commonly deficient, namely, nitrogen, phosphorus, and potash. For this reason, the so-called "complete" artificial manure contains the above three, e.g., 2 : 2 : 1 "complete" manure contains 2 parts of superphosphate, 2 parts of sulphate of ammonia, and 1 part of sulphate of potash. Signs of mineral deficiency in fruit trees are normally first seen in the foliage. Leaves suffer long before the fruit. The major portion of a tree's mineral intake is used to produce growth, and only a comparatively small amount to produce fruit. With a properly controlled experiment it takes some years to show whether or not any particular manurial treatment increases the yield, but a quicker response is seen in the general health of the trees. The difficulty in demonstrating significant increases in the yield by manurial treatment is partly due to the small amount of minerals used in fruit formation, and to the fact that tree root systems remain in the ground in a more or less active condition, all the time tapping a large volume of soil. So that trees may accumulate considerable quantities of the essential elements from a low soil concentration and at a slow rate of supply.

The response of annual crops is not a reliable guide to fertilizer practice for trees. In most parts of Victoria superphosphate gives spectacular results with annual crops but gives no visible results with fruit trees.

At present there are no suitable chemical tests of soil fertility, and the only reliable way of finding out the manurial requirements of fruit trees is their behaviour and response to different treatments in test plots. For the above reasons the primary aim is to maintain tree health, which, in turn, must influence yield.

FERTILIZER TRIALS

Fertilizer plots on the Mornington peninsula and in the metropolitan area have shown increased yields due to 2 : 2 : 1 "complete" manure. In Goulburn Valley trials sulphate of ammonia has given a profitable increase with pears under irrigation. Other experiments have shown that fertilizers containing nitrogen can be profitably applied to peach and citrus trees. The complete results of these experiments will be published at a later date. Artificial fertilizers or other manures are not substitutes for proper pruning, irrigation, drainage, or other important cultural operations, but they can be used profitably in orchards.

DEFICIENCY SYMPTOMS AND RECOMMENDATIONS

Nitrogen

Trees suffering from nitrogen deficiency have yellow-green leaves, fruit is usually small and highly-coloured, and the lateral growth of pear and apple trees may be reddish in colour. With severe deficiency, shoots are short and thin, foliage is sparse, leaves are small and pale-green, blossoming is poor but storage quality of fruit is very good.

Nitrogen deficiency can be corrected by an application of one or other of the nitrogenous manures. The nitrogen in sulphate of ammonia is more readily available than that in organic manures such as blood-and-bone, fowl-yard manure, stable manure, and castor meal.

Generally an application of 4 or 5 lb. per tree of sulphate of ammonia (5 cwt. per acre) is satisfactory for full-grown, deciduous trees. The equivalent, using blood and bone, would be 15 to 25 cwt. per acre, dried blood, 8 cwt. per acre, poultry manure, 2½ tons per acre, stable manure, 10 tons per acre. The organic manures do more than supply a source of

nitrogen; they help to build up the organic content of the soil, which, as indicated previously, is very important.



Potash-deficient leaves (front and back) showing the characteristic marginal scorching which usually develops in late summer.

The best time to apply manure is in early spring, two or three weeks before bud burst. Artificial fertilizers should be ploughed in immediately after broadcasting.

Phosphorus

It is difficult to demonstrate the value of phosphatic manures for fruit trees, and symptoms of phosphorus deficiency are rarely if ever seen in orchards. In pot culture phosphorus deficiency causes the following symptoms. Young leaves are dull dark-green, mature leaves are bronzed, stems and leaf stalks develop purplish pigment and new twigs are slender and leaves are small.

The reason why trees do not respond to superphosphate may be fixation near the surface by clay which renders the phosphate insoluble, in which case the applied fertilizer never reaches the root zones. In any case, the small amounts of phosphorus present in the soil are apparently sufficient. An indirect benefit is the influence of superphosphate on the growth of green crops.

Potash

Potash deficiency causes death of leaf tissue varying from small patches to extensive marginal scorch. Foliage, especially of peach trees, is usually wrinkled. The

dead patches develop first on mature leaves near the middle of the current season's growth.

When potash deficiency is slight there may also be symptoms of nitrogen deficiency because trees lacking potash cannot utilize nitrates efficiently. There must be a proper balance between the available nitrogen and potash in the soil. When nitrogen is added it may also be necessary to increase the potash to obtain results.

Potash is associated with the health and vigour of the tree and with the storage of starch and sugar. The usual form of application is in complete manure, e.g., 2 : 2 : 1, &c. In the case of severe deficiency sulphate or chloride of potash can be applied at the rate of 2 or 3 lb. per tree. Apples require more potash than most other fruits.

The deficiencies already mentioned are the major ones which are corrected by manurial treatment, but there are others which occur with moderate frequency in orchards, and some of the more important of these are given below.

Zinc

Zinc deficiency causes the condition known as "little leaf" in deciduous and "mottle leaf" in citrus trees. In deciduous trees, twigs are slender with very short internodes near the tips causing typical rosettes



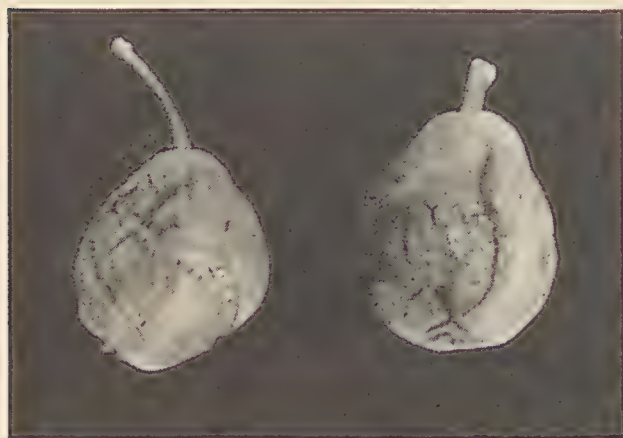
Nitrogen-deficient leaf, yellowish-green throughout growing season (right) and bright-yellow at defoliation (left).

of small narrow leaves. Defoliation commences at the base and works up to the tips of twigs.

The treatment for deciduous trees is a zinc-sulphate spray in winter, 50 lb. of zinc sulphate in 100 gallons of water, and, for citrus trees, 10 lb. zinc sulphate, 5 lb. slaked lime in 100 gallons of water applied in September before the spring flush of growth.

Magnesium n

Magnesium deficiency causes interveinal necrosis or death of leaf tissue. Older leaves are affected first and defoliation commences at the base and travels upwards. On citrus trees older leaves show



Boron deficiency symptoms in Black Achan pears.

a chlorosis which extends from the margin to the midrib. This chlorosis gradually extends towards the base of the leaf and a spearhead of green at the base is typical. The treatment is an application of magnesium sulphate (epsom salts) to the soil at the rate of 2 or 3 lb. per mature tree.

Boron

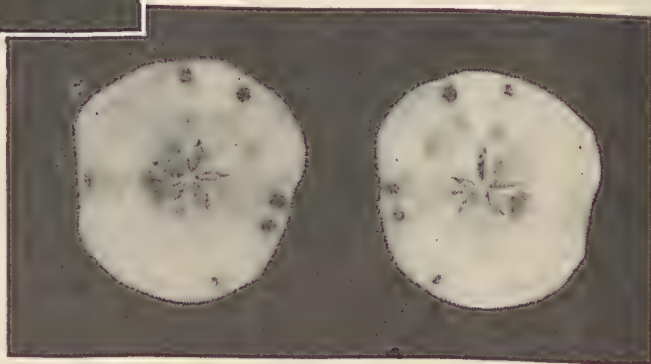
A deficiency of boron can cause internal and external cork of pome fruit. Internal cork may form at any period in the growth of the fruit. If it occurs early, fruit is deformed, but if it occurs late in the growing season the brown lesions are larger but the fruit is not deformed. In severe cases boron deficiency can cause die-back.

The treatment is an application of borax to the soil at the rate of $\frac{1}{2}$ lb. for a large tree and half this amount for a small tree.

GREEN MANURING

As indicated previously, when soils are deficient in organic matter, it is desirable to build up the organic content. The most practicable way of doing this is to grow and plough-in green-manure crops. Such crops have other beneficial effects, such as using some of the excess water and helping to prevent soil erosion in winter.

It is desirable to choose a crop high in nitrogen. If one high in carbohydrates, such as a cereal crop, is ploughed-in, the immediate effect might be to reduce the amount of nitrogen available to the trees. The reason for this is that the soil organisms require nitrogen for their life processes, and, with a crop low in nitrogen, might use most of the soil nitrogen for their own purposes. Ultimately, the organisms die and the nitrogen again becomes available, but a temporary nitrogen deficiency could be caused. On the other hand, the turning under of a crop high in nitrogen supplies more than enough nitrogen for the soil organisms, and the excess, released as ammonia, is converted



Internal cork in an apple due to boron deficiency.

into nitrates which become available to the trees.

Leguminous plants are particularly valuable, because their root nodule bacteria fix atmospheric nitrogen. A good crop of tick beans ploughed under in spring provides a supply of nitrogen equivalent to an application of 4 to 5 cwt. per acre of sulphate of ammonia. Other plant foods are released, soil texture is improved, and cultivation

is easier. Tick beans, dun peas, and New Zealand blue lupins all make good green crops.

Early planting is essential in order to get plenty of growth before winter conditions become too cold. If early sowing interferes too much with harvesting, alternate lands only can be sown. Drilling is best, but broadcasting gives good results. Tick beans, peas, or lupins are sown at the rate of $1\frac{1}{2}$ bushels per acre, together with superphosphate at the rate of 2 cwt. per acre. If a green crop cannot be sown, a good growth of weeds can be stimulated by application of superphosphate.

The crop is ploughed-in well before blossoming. It is undesirable to have the crop plants competing with the trees for water after tree-growth commences.

Trashy Cultivation

The so-called "trashy cultivation" is interesting as it is believed that the only reason for cultivation in the summer is to prevent weeds competing with the trees for moisture. Most of the green-crop residue would be left on the ground surface and would take a little longer to break down. If orchard soils are so depleted in organic matter that green crops will not grow, mulching with straw or some other suitable material would be beneficial. Heavy applications of stable manure are valuable in this respect.

NO-CULTIVATION SYSTEMS

A system of sod culture with no cultivation at all should be ideal for maintaining fertility. Unfortunately, in Victoria, summer rainfall is the limiting factor to this form of culture which would be possible



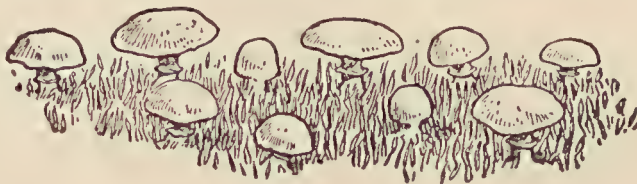
A green manure crop (tick beans) in a Pakenham orchard.

only in irrigation areas where adequate water is available. There is a good example of an apple orchard under sod at Bacchus Marsh.

In England, this form of soil management is widely used in mature orchards. The pasture is kept short by grazing with stock. If stocking is not desired the pasture could be mown and the clippings left on the surface. Subterranean clover has possibilities for this system. If a good stand can be established to the exclusion of other species, it would die off in the summer and not compete with the trees. In the autumn it would grow again, having re-seeded itself. Alternatively, a strip of the clover sward could be left for re-seeding purposes and the rest ploughed-in.

Another type of no-cultivation system involves the use of oil sprays to kill surface growth. In U.S.A. maintenance of a permanent straw mulch to a depth of 8 inches or more has given good results.

Experimental work on systems of "no cultivation" is being carried out in northern Victoria, and, until further information is obtained, it is not possible to make any definite recommendations regarding these practices.





The Science of Milk Production

The following is a transcription of a talk given by Dr. W. E. Petersen, Professor of Dairy Husbandry, University of Minnesota, U.S.A., and is taken from the sound track of the film, "The Science of Milk Production". Many Victorian farmers have viewed this film; during the past twelve months in the course of film screenings given by the Department of Agriculture Mobile Film Unit, and numerous appreciative references have been received indicating the deep impression the film has made on Victorian dairy farmers.

The commentary by Dr. Petersen is repeated in the Journal for the information of those farmers who may not have seen the film and to refresh the memories of those who did.

"THE productive life of the cow can be divided broadly into a cycle of four periods. The first, the dry cow or expectant mother; the second, the calf; the third, the growing heifer; and fourth, the milking cow. This last stage is of the greatest interest to the practical dairyman, because after treating the herd to about two years of free room and board he is expecting his guests to begin to pay, and to continue to pay—or else!

"Every dairyman is, in reality, a factory owner. Every one of his cows is a separate production unit. Most of us have taken these milk-making factories for granted, but every manufacturer must know what goes on inside his plant.

"Most people think that the cow leads a quiet life, with nothing to do but eat, chew her cud, loll around the pasture or barn, and then submit quietly to milking. Actually, she is one of the hardest working domestic animals. Her body must perform

an almost unbelievable amount of work to produce 50 lb. of milk a day. She makes this milk from materials in her blood. About 400 lb. of blood flows through the udder for every pound of milk produced. That means that the heart must pump through the udder alone 20,000 lb. of blood for a single day's production of 50 lb. of milk. This is the same amount of work it takes to load 10 tons of manure on a spreader 63 inches high, and any farmer will tell you that is a lot of work.

"It is only from the blood that the udder gets materials for making milk, and most of these materials come into the blood only if they are present in the feed. This emphasises the importance of a proper understanding of nutrition.

"In an experiment we injected hexamine blue into the blood of a cow to demonstrate that food substances find their way into the milk from the blood stream. The cow gave blue milk. We also found that the

odours of moth balls, silage, vanilla, turpentine, and many others, when placed where the cow could inhale them, passed from the lungs into the blood, and from there into the milk. This proves that the flavour, as well as the nutritional values of the feed, should be considered in the diet for quality milk production. Another element that must be in the blood to make milk is a hormone called prolactin. This hormone is released by the pituitary gland at calving time, and continues to be secreted into the blood.

"Other hormones are responsible for the development of the udder. In one of our experiments we developed the udder of a heifer by injecting a synthetic hormone, and, as a result, this heifer, which had not been bred, produced 20 lb. of 6 per cent. milk daily.

"Of course, we find that the bull is still very important, especially if we are interested in developing and maintaining fine dairy herds.

"Sometimes even a cow with a well-developed udder will be a poor producer because she is getting too little of the hormone prolactin. We got very little milk from one cow. Then we injected the hormone. This increased her milk production 60 per cent. in a week's time, which again proved the need for this hormone in the blood. We can't go around injecting hormones into cows at every milking, so, if the cow has been well fed and cared for, and still does not produce enough milk, the best solution is the butcher's shop.

HOW THE COW MAKES MILK

"So far we have seen that the blood carries the raw materials to produce milk. We all know that the output of a plant can be no better or greater than the raw materials that you put in, so now let us see how the cow makes milk.

"Blood is pumped from the heart to each half of the udder through sacral arteries, which then branch into two arteries, one to each quarter. Each quarter of the udder is a separate milk-making machine. That is why mastitis may be confined to just one quarter. The blood vessels end up as small capillaries, which surround the milk-making bulbs called 'alveoli'. They look like miniature bunches of grapes. In general, the quantity, as well as the

quality, of the milk depends on what the blood vessels deliver to these bulbs. Each of these bulbs is a tiny udder, which produces a fraction of a drop of milk a day. It takes milk from millions of these bulbs to make up the daily production of the cow.

"Let us look inside one of these bulbs. Each is like a rubber ball lined with a lot of tiny cells. Milk ingredients are collected in these cells, which then deposit the milk in the hollow space in the centre of the bulb where it is stored until milking time. The gap between the blood vessels and the milk cells is filled with a juice called lymph. This juice actually carries the milk ingredients from the arteries to the milk cells, and returns the waste to the veins, for repumping by the heart. The blood and milk substances can flow back and forth through the walls of the blood vessels, because milk and blood have the same osmotic pressure.

"This fact is of practical importance, because if milk is not taken when the udder is full, the pressure in the udder becomes great enough to reverse the flow, so that the milk ingredients will flow back into the blood stream. Let us see why this is so. Our mechanical milk factory will serve to demonstrate. The materials flow from the supply line to the bulb, which is busy producing milk, but, as the bulb fills up, the pressure rises. When this pressure reaches a certain point the milk ingredients flow back to the blood stream. We are losing milk now. It should have been taken before the pressure became so great. The milk-making process is continued 24 hours a day. As the milk bulbs begin to fill up, the pressure in the udder increases. As the pressure increases milk production slows down, so that it is the slowest as the milking time approaches. More frequent milking of heavy producers gives better milk production.

"Milk production also depends on the condition of the milk-making bulbs. When they are destroyed by mastitis these will shrivel up, much like the changing of grapes to raisins, and we cannot change raisins back to grapes. Healthy milk cells look like this under a microscope, but, when mastitis attacks, these milk bulbs shrivel up and are replaced by scar tissue. The cells cannot be restored, and milk production falls off. You can detect the scar tissue when the udder has been milked

out. It feels firm, meaty, and often lumpy. So, when purchasing new stock, look for an udder that feels soft and spongy. This is an indication of healthy alveoli.

"Now let us see what happens to the milk produced by the alveoli. Each alveolus empties into a small tube. Millions of these small tubes connect up with 50 or more larger tubes which empty into the gland cistern. This gland cistern is the milk storage chamber, big enough to hold up to a quart of milk. From the gland cistern the milk goes through a hole in a delicate membrane which serves as a constriction between the gland cistern and the teat cistern. Parts of this membrane thin down to a single layer of cells. This makes it more susceptible to injury at these points.

"For the first time in motion pictures we have been able to photograph the action on this delicate membrane from the *inside* of the milk cistern. This is what happens during proper hand milking. Notice how it opens and closes to permit milk to pass into the teat cistern. But, when hand milking becomes too vigorous, the delicate membrane is rubbed up against itself. This irritation may be a possible point of attack for mastitis. The same condition may occur when using a milking machine. When the udder is full the teat cups remain in their proper places and milking is normal. Towards the end of the milking when the udder has been almost emptied the teat cups begin to climb. Here again the membrane is rubbing up against itself; so we can see how important it is in good milking practice, whether by hand or by machine, to remember this delicate membrane; and that is why the milker should know by feel when the udder is empty and then stop milking.

"From the teat cistern the milk is forced into the streak canal. The lining of this canal is a continuation of the outside skin of the teat. In the canal is a sphincter muscle which keeps the canal closed. When pressure is applied to the teat during milking the muscle is forced open by the pressure of the descending milk, and the milk is forced through the canal. The nervous system of the cow includes a fine network of nerves spread over the skin of the udder and the teats. This makes the udder quite sensitive. An ice cube, for instance, actually makes the teats shrivel

up. The teats are extremely sensitive to touch and to temperature. Warm the teat cups before putting them on the cow. We have seen how the cow produces milk from the raw materials in the blood, in the milk-making bulbs of the udder from which it flows through the gland cistern, the teat cistern and out of the streak canal. This is the machinery of the milk-making plant.

WHAT MAKES THE COW LET-DOWN MILK

"Now let us see what makes the delivery department work; what makes the cow give milk. To be a good producer the cow must not only be able to fill its udder to capacity, but must also be able to let down the milk and give all of it at each milking. The amount of milk from each of the tiny milk-making bulbs is so small that it cannot drain of its own weight, so the milk must be squeezed out much like squeezing a rubber bulb. The tiny muscles which surround these bulbs squeeze out the milk. But what stimulates these muscles to act?

"We thought at first that the cow controlled this let-down of milk by sending a message directly from the brain through the nerves to the udder. We found this not to be so by cutting the nerve which connects the udder with the brain so that no message could get through. This led us to suspect that some hormone might be responsible. By injecting various hormones we finally discovered that the hormone known as oxytocin from the pituitary gland caused the muscles around the milk bulbs to go into action and squeeze out the milk. To prove that this is the hormone released at milking time, we resorted to our mechanical cow. We removed the udder of a cow and collected the blood from the same cow. The blood was pumped through the udder by a pump which served as an artificial heart. The blood returning from the udder was sent through an artificial lung for purification. With this setup we could study the making of milk and also what the blood needed in order to let down the milk. At the start of the experiment we drained all the milk from the udder. Then we pumped blood through the udder for about seven hours. We injected the let-down hormone into the blood stream. We then took as much milk from the udder as the cow

would normally have given. Now, to prove that the cow releases the hormone into the blood stream, we took a quart of blood from a cow ready for milking and pumped it through the udder. This caused a let-down of milk, proving that the substance responsible for the let-down is in the blood. We tried blood from a cow not ready for milking, but without effect—proving that the hormone is not released until the cow is stimulated at milking time.

FACTORS RETARDING LET-DOWN OF THE MILK

“During one of these experiments we had an accident, a fortunate accident, which gave us information of great importance to the dairyman. In attempting to draw blood from one of our cows, she got so excited that she broke her halter. We managed to get the blood anyway. But, when this blood was used in our mechanical cow, the blood flow in the udder slowed down to less than one-fifth. This meant that, when she became excited, her adrenal gland released epinephrine into the blood. The epinephrine constricted the blood vessels and interfered with the action of the let-down hormone. Excitement may be caused by noise, pain, rough handling, or just plain annoyance. To show how the cow reacts to pain, a kitten was placed on the back of a cow ready for milking. Every time the cow moved the kitten's claws dug more deeply into the cow's back. The only milk she gave was that which was in the teats and lower cistern. In another experiment we showed that the cow is very sensitive to anything she hears. Paper bags were exploded every twenty seconds—cows down the whole line were affected, and milk production fell off. We tried the experiment of putting some grain out of reach of the cow while she was being milked. She was annoyed, so we did not get all of her milk. What little we did get came slowly over a long period of time. One of our cows, with an average of 15 lb. at each milking, was accustomed to a milker in whom she had confidence. He was part of her daily routine. But, when we deliberately had him milk her roughly, she was under constant nervous tension. This experiment, just as in the case of the pain or noise, released epinephrine which slows down or cuts off completely the “let-

down” hormone. In this experiment the cow gave only 6 lb. of milk instead of her usual 15 lb.

“So you can understand why a cow must not be excited at milking time. You cannot run around injecting hormones, but you can have kind and considerate milkers who will give certain hormones a chance to work for you. Hence, one of the important rules of good milking is—avoid excitement.

COWS WILL RESPOND TO FAVOURABLE STIMULI

“Cows may be trained to respond to familiar actions. The release of the let-down hormone can be stimulated by the washing or massaging of the udder, the mere sound of a milking machine, or the rattling of the milking utensils. Many cows respond quickly to the sight of feed at milking time. Dairy men should know the habits of each of their cows, know what they like and what will stimulate the let down. In our experiments we found that the let-down hormone is effective only for a short time after it reaches the blood stream. This means that we must get the milk out of the cow rapidly if we are going to get all of it. We washed the udders of a number of cows with about the same milk capacity. The washing, of course, stimulated the release of the hormone and the let down of milk. Then we deliberately let several wait for twenty minutes before we took their milk, while we milked the others immediately. The cows that waited twenty minutes gave an incomplete milking because the hormone had been released when the udder was washed; the milk was let down but not taken. This had built up the pressure in the udder so that some of the milk ingredients had poured back into the blood. This really begins the drying-off process. So that another of the good-milking rules is—do not stimulate let-down until one minute before milking.

“We believe that many a short-time cow can be explained by incomplete let-down of milk. There is also much evidence to prove that incomplete milking is a contributing cause of mastitis. In an experiment to show the importance of rapid milking, we milked one quarter at a time, going around the udder. Each quarter was milked dry. The quarter milked first gave the most milk, and the last

quarter gave the least. About 2 lb. of milk were lost in this one milking because the effect of the hormone was permitted to wear off. One good producing cow can lose more than 2,000 lb. of milk during one lactation if she is not milked when she is ready.

SOME COMMONSENSE RULES

"All these experiments simply boil down to a few commonsense rules for good milking:—

"Avoid excitement—strange noises or rough handling will retard the let-down hormone and result in less milk.

"The cow, too, has nerves. Warm the teat cups before putting them on the cow.

"Do not stimulate let-down until ready for milking—about one minute before the milking machine is put on wipe and massage the lower part of the udder and the teats with a clean cloth dipped in warm water. This will stimulate let-down and milking should begin at once.

"Operate the milking machine according to the manufacturer's directions. Increasing the vacuum or altering the rate may make it unpleasant for the cow. That will only cut down the amount of milk she

gives. Remember that, as milking progresses, the lower part of the udder becomes soft and flabby, offering less resistance to the tugging action of the machine. The teat cups crawl up on these soft tissues and shut off the milk ducts leading into the teat. This not only shuts off the last milk in the udder, but invites injury which may lead to mastitis. So, when the teat cups crawl up, pull them down part of the way, so that the rest of the milk can be taken by the machine.

"Last, and most important, milk fast—The faster a cow is milked the more milk you will get. With machine-milking, three and a half minutes should be time enough to get all of the milk.

"Dairymen who have followed these rules have increased milk production.

"Cows are creatures of habit. It is easy to make a poor milker out of a cow by poor milking habits. They are very accommodating in that way, and it is up to the milker to train her to milk properly. If we train our cows to milk properly by practising these simple rules, we can save three minutes per cow per milking, or six minutes a cow a day. The dairy industry of this country would save millions of costly man-hours, and with the saving of labour would come a great increase in our national milk production."

Milk Fever in Dairy Cows

Milk fever makes its first appearance usually 12 to 72 hours after calving, and attacks may also occur prior to calving, and sometimes months afterwards. Affected cows are at first disinclined to move, with paralysis first affecting the hind limbs. Difficulty in standing is followed by the animal going down, often lying with the head turned to the flank, or with a lateral kink in the neck. There is a complete loss of appetite, the muzzle is dry, and the extremities cool to touch.

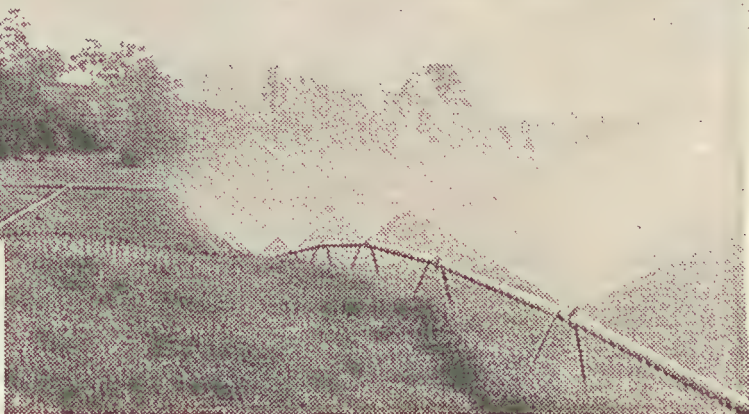
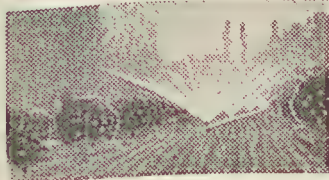
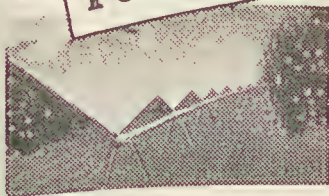
Treatment consists of injecting calcium borogluconate in a 20 per cent. solution with pure, sterile water under the skin by means of a needle and syringe. A 20 per cent. solution can be made by dissolving a 2½-oz. packet of borogluconate in 12 oz. of boiled water. Inject at blood heat—95° to 100°F. Such a dose would suffice for the average case. Boil all needles and syringes immediately prior to use, and clip the site of the injection, and swab with iodine.

Some farmers use the udder inflation method of treatment which may give results when the borogluconate does not. (The reverse is also true.) When this method is used the teat should be swabbed with methylated spirits and teat syphons must be boiled. For preference the air should be pumped through a filter containing medicated gauze to lessen the risks of subsequent udder trouble.

Cows known to be prone to milk fever can be protected by an injection of calcium borogluconate ½ dose immediately before calving and the balance shortly after calving.

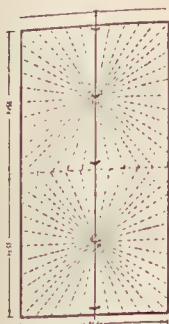
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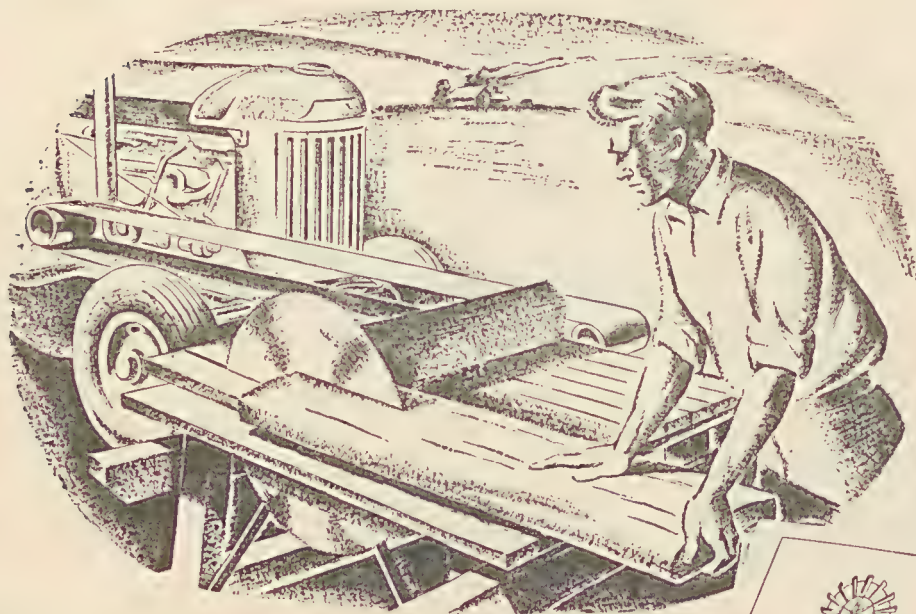
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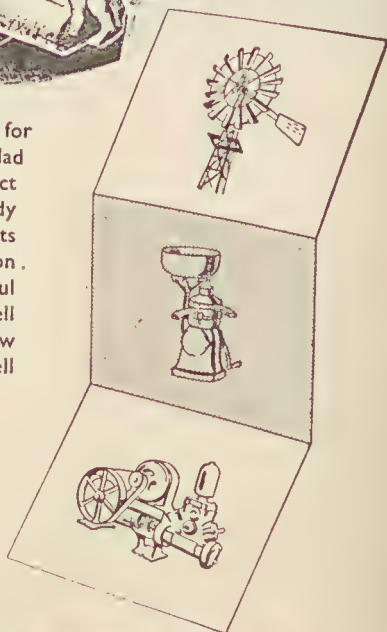
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By W. J. Tame, Field Officer, Soil Conservation Board

THE fourth annual Goulburn Catchment soil conservation competition maintained the standard set in previous years in respect to both the number and the quality of entries received. Local government bodies continued to support the competition, and eight shire councils offered prizes for the best entry within a shire. In addition, Cr. G. S. Wall, of Gowangardie, donated a prize for the best entry within the North Riding of the Violet Town shire. Thirty-one entries were received for the whole competition, but the distribution of entries was such that in only three shires, namely, Benalla, Euroa, and Yea, were sufficient entries received to allow the award of a shire council prize.

The total area submitted for inspection in the 31 entries was 27,763 acres, compared with 40,182 acres for 34 farms in the 1947 competition. These figures show quite a large drop in the average size of farm entered. This is pleasing in that it indicates that the smaller landholder is

becoming more soil-conservation minded, and making efforts to maintain or increase production. The statistics of the competition also show that 1,037 acres of the total of 27,763 have been contour-furrowed, and, while it is recognized that contour-furrowing of all sloping country is not necessary, it is encouraging to find the job being carried out where it is necessary or desirable. Contour-furrowing effectively controls run-off of rainfall from sloping country, allowing maximum penetration of moisture with a consequent increase in pasture cover, nature's own way of protecting the soil. Contour furrows are most valuable where the ground cover has been depleted and the surface soil "skinned over".

GRAZING PRACTICE

The fact that the settled portion of the Goulburn Catchment is largely hilly and is used for grazing purposes makes pasture cover the principal means of combating

accelerated erosion. This pasture cover can be divided into three main categories:—

1. Native grass species persisting without artificial manure.

2. Native grass species top-dressed with superphosphate.

3. Improved grass species top-dressed with superphosphate.

The incidence of these three types of pasture is determined largely by topographical conditions, and they vary considerably in the grazing management required to satisfy the needs of stock fodder and soil protective cover.

The areas supporting native grass species without superphosphate are found on the steepest slopes on which top-dressing cannot be carried out. Because of their location and the consequent high erosion hazard, the need for satisfactory vegetative cover is greatest, as it is from these areas that the greatest run-off occurs. As the best means of erosion control lies in vegetative or pasture cover control, the areas are best maintained by so arranging grazing that the native species are retained. Reasonable returns and soil protection can be achieved by grazing principally during the winter, and treating the area sparingly during the summer and early autumn. Such practice allows maximum seeding of the annual species and assures sufficient protective cover during the period of the year when the erosion hazard is greatest.

The second group of pastures are found on the lesser or intermediate slopes. On these, top-dressing operations can be readily carried out, but slopes are too steep to allow normal cultivation. Top-dressing and the introduction of subterranean clover provide means of readily increasing carrying capacity. Some form of modified cultivation may be used for the introduction of subterranean clover, but such working can only be carried out once and by a very light implement. The maintenance of a desirable balance of native grass species with subterranean clover presents problems in pasture management. The presence of subterranean clover in pasture is desirable to provide protein-rich feed for stock, and as the means of naturally increasing soil fertility. Incorrect applications of superphosphate promote vigorous clover growth, and the native grasses tend to disappear. Excessive clover dominance in a pasture,

however, is not ideal from the production and nutritional point of view, nor is it the ideal pasture for soil protection throughout all periods of the year. Hence the interest of the soil conservationist in maintaining a balance between grasses and clovers.

Clover-dominant pastures may give rise to other problems in grazing, such as may be occasioned by the appearance of "high-fertility weeds" (e.g., barley grass and capeweed), following a check to the clover and consequent serious depletion of plant population. The maintenance of a productive and erosion-resisting pasture on these sloping areas is very much dependent upon the observations of the landholder. Generally speaking, clovers withstand heavier grazing than the grass species and give a quick response to superphosphate. Therefore, appropriate applications of superphosphate and careful control of stocking rates and times must be combined for satisfactory results in maintaining grass-clover balance, grazing returns, and soil protection. Grazing by both sheep and cattle gives more satisfactory results from an all-round viewpoint, than grazing by either class of stock alone.

The third section contains the gentler slopes and flat country, and it is on these areas that greatest progress in pasture improvement has occurred, as improved pastures can be established by means of a prepared seed-bed. When satisfactorily established, these sown pastures have proved capable of carrying the bulk of the grazing over the greater portion of the year, and of providing also the fodder reserves for the farm unit. Similar treatment of native pastures as that described for the intermediate slopes, will have a similar effect. Management is far easier and the erosion hazard due to mistakes in management far less, largely because an improved species of grass can be sown should the native grass species become unduly thinned out.

The improved perennial grasses, such as rye grass for the areas of better soil and moisture conditions, and *phalaris tuberosa* for the dryer conditions, therefore play an important role in these areas. Better results can be expected from them where clover has previously grown. It is on such pastures that regular applications of superphosphate give maximum returns.

Each of these three groups of pastures give varying types and quantities of fodder, available at varying periods of the year. If the ideal control is to be achieved, it is most desirable to separate by fencing, the areas producing the different pastures. Since these areas are in turn determined largely by topography, it follows that, in order to have country of the one type in each paddock, the main divisional fences must run somewhere along the general contour. Further subdivision can reduce paddock size and facilitate grazing control. Easier initial destruction and later control of rabbits may justify the use of rabbit-proof netting for some subdivisional fences. Some properties inspected during the competition are subdivided excellently and the resultant control of grazing and vegetative cover is most apparent; such competitors must be regarded highly in a competition where grazing is the outstanding farm practice.

MEADOW HAY

The season of 1947 proved to be an excellent one in the district and most competitors were happily situated from the point of view of feed in the paddocks. There was, however, a greater range in regard to fodder conserved, the quantity and quality of which varied considerably. Careful thought must be given to areas where pasture is to be cut for hay. It is found that clover, if cut continuously, will thin out and leave room for the appearance of the more undesirable grasses. The best paddocks to cut for meadow hay are those supporting perennial grasses with clover, and receiving regular dressings of superphosphate. If a clover-dominant pasture is cut for hay, a good plan is to lightly cultivate the area "dry" in the autumn, and sow down a desirable grass species. This operation may be done with or without a cover crop, with little loss of grazing or detriment to the clover, and a desirable pasture should result, with no danger of heavy weed infestation.



Erosion of the steep slopes in the background has been caused by overgrazing. Good grazing management is possible only if fences separate different soil and topographic conditions.

Entries for this year's competition were as follow:—

Name of Competitor.	Address.	Shire.
G. G. Foletta and Son	Buxton ..	Alexandra
G. W. and J. P. Raws	Cathkin ..	Alexandra
L. J. Webster ..	Acheron ..	Alexandra
E. Barnes ..	Benalla ..	Benalla
E. E. Cooper ..	Goorambat ..	Benalla
C. S. Hartridge ..	Benalla ..	Benalla
W. J. and M. Hill ..	Baddaginnie ..	Benalla
T. M. Sinclair ..	Thoonia ..	Benalla
T. C. Wise ..	Winton ..	Benalla
C. R. Barton ..	Creighton's Creek	Euroa
B. D. Brady ..	Gooram ..	Euroa
C. M. H. Chomley ..	Longwood ..	Euroa
R. F. Kelsall ..	Creighton ..	Euroa
M. R. McIntosh and Son	Castle Creek ..	Euroa
N. J. McKendrick ..	Balmattum East	Euroa
L. J. Sargood ..	Gooram ..	Euroa
K. Stribling ..	Euroa ..	Euroa
R. H. Threlfall ..	Creighton ..	Euroa
C. G. Halpin ..	Broadford ..	Kilmore
J. H. Ross ..	Mansfield ..	Mansfield
E. C. L. Head ..	Seymour ..	Seymour
N. A. E. Johnson ..	Tallarook ..	Seymour
S. Shelton ..	Avenel ..	Seymour
I. D. Green, Mrs. ..	Violet Town ..	Violet Town
G. S. Wall ..	Earlston ..	Violet Town
R. J. Wilson ..	Violet Town ..	Violet Town
T. C. Byrne ..	Spring Valley ..	Yea
P. J. George ..	Strath Creek ..	Yea
H. C. Gordon ..	Murrindindi ..	Yea
L. C. Hollis ..	Broadford ..	Yea
W. E. D. Robinson..	Flowerdale ..	Yea

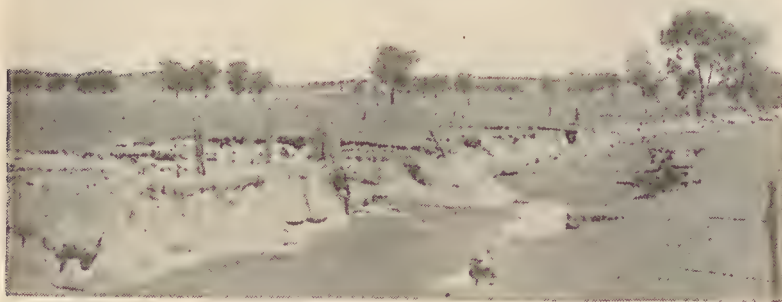
THE AWARDS

Mr. L. J. Sargood, of Gooram, has been awarded the Hanslow Cup for 1948. His property, situated nine miles from the town of Euroa on the southern side of the Hume Highway, consists of 1,200 acres, varying from steep granitic hills to moderately undulating country, and is used entirely for grazing.

The property has been under the present management for a number of years and normally carries slightly in excess of one sheep to the acre, plus lambs reared, and with cattle in the proportion of one beast to twenty sheep.

The outstanding feature of the property is the layout of the hill country and its management. The general plan has been to fence across the hill, in effect roughly on the contour. Further subdivisional fences up and down the hill reduce paddocks to a manageable size and facilitate rabbit control, which, in this country, is a constant and difficult job. One particularly difficult and rocky outcrop has been netted off and is not used for grazing purposes.

The grazing plan has been to reduce the stocking of the hill country to a minimum during the summer months and carry the stock on the flatter country. Ample fodder reserves have been provided, and, if necessary, hand feeding may be done to preserve the protective vegetative cover on the hills. At the time of inspection a very satisfactory cover was evident on all sections of the property, which is divided into 22 paddocks with an average size of 55 acres.



Gullying along a roadside in Goorambat district, with intensive "fingering" into adjoining paddocks, caused by excessive run-off from higher country in the background.

Subterranean clover and native grasses have been well maintained in suitable proportions and provide the bulk of the pasture on the property. A small area of Wimmera rye grass has been sown and shows promise of being a grass very suitable to the area; it may provide a greater bulk of feed than the existing pastures.

Excellent use has been made of spring water; several springs have been boxed and water gravitated through pipes to troughs for stock purposes, while one large spring has been dammed with concrete, and, by gravitation, supplies domestic needs as well as stock water for several paddocks.

BENALLA SHIRE

The Benalla Shire Council trophy goes to Mr. C. S. Hartridge, who has not long been the owner of the property, and whose alterations to the general lay-out, improvement to water supply, and general management, win for him the above award.

The improvement to water supply includes the cleaning of a water-hole on a semi-permanent creek running through the property, and pumping to overhead tanks for domestic and house paddock supply. Two new dams have been excavated in well-chosen sites, and so arranged as to provide water for more than one paddock. The construction of these dams became necessary because of the alterations to the layout, which now separates the rising ground from the flatter country adjacent to the creek. There was ample evidence of previous trafficking of stock up and down the hill to water, and, in some cases, small scours had occurred. The fence lines also separate the northern from the southern aspects, giving further control of grazing.

Extensive work has been done by this landholder in pasture improvement. A small area of phalaris tuberosa has been satisfactorily established, but the main improvement has been obtained by the introduction of Wimmera rye grass, with a cover crop of oats, to paddocks formerly

predominating in clover. Cultivations were done mainly with disc implements with the final sowings across the slope. Finish lines and old scours in the areas cultivated were protected by placing logs on the contour to impede the flow of water; these may be removed when the areas are satisfactorily held by pasture.

Erosion control work on the property of Mr. T. Wise, the winner of the Benalla section of the 1947 competition, has progressed very satisfactorily during the past twelve months. Further areas have been contour-furrowed, and more subdivision done. These measures, together with the use of cattle and a light stocking rate, have resulted in a good cover of grass being maintained on the property.

A small area of particularly raw country was sown to cereal rye, Wimmera rye grass, and subterranean clover, and now shows promise of returning to profitable production.

Mr. T. M. Sinclair, of Thoona, has carried out a plan of water diversion and absorption on rather badly-scoured sections of an old cultivated paddock. The area was cultivated and sown to pasture.



Neglect of sheet erosion and tunnelling can lead to the destruction of valuable land as illustrated. Wise land management would have prevented this loss.

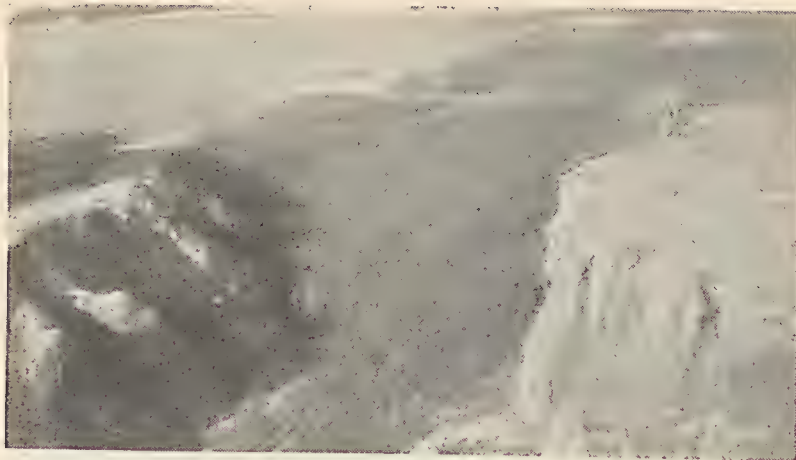
Mr. E. E. Cooper is a member of a group of farmers in the Goorambat district who have undertaken a co-operative scheme for the control of erosion in the area. Mr. Cooper has contour-furrowed a small hill and exercised care in grazing over the past eighteen months. The benefit derived is most apparent.

Mr. E. Barnes has done some outstanding work in reclaiming a section of country badly affected by tunnel erosion. The procedure adopted was to twice plough the tunnels with a road plough, the second ploughing or subsoiling reaching the bottom of the tunnels. Harrowing, grading, and seeding with Wimmera rye grass, cereal rye, and subterranean clover were then carried out, followed by contour-furrowing. The area, formerly severely eroded, without a vestige of vegetation, has now some grazing value, which should be further increased with careful treatment over the next season.



A patch of formerly tunnelled country near Benalla. This was ploughed to the depth of the tunnels, graded, sown to cereal rye, Wimmera rye grass and subterranean clover, and then contour-furrowed, autumn, 1947. The photograph was taken in October, 1947.

Messrs. W. J. and M. Hill exhibited a property where improvements in grass cover and pasture species have been in progress for a long time. Rabbit control has been a feature of the farm management, and the



The vertical head of this gully, Goorambat district, was battered down, shaped and sown with grass. Straw, held down by old netting, gave protection until the grass was established.

most recent aid to a complete soil conservation programme has been the contour-furrowing of some 50 acres and construction of a diversion bank to control sheet erosion and an active scour. The surface soil had been removed by sheet erosion and a layer of gravel also removed for road-making purposes. The work was too recent for noticeable results, but has been well maintained, and, if success is achieved, should be an added incentive to holders of similar country to carry out the same type of work.

EUROA SHIRE

Nine entries were received from the Euroa Shire and the shire council trophy is awarded to Mr. R. F. Kelsall, of Creighton. The special features of the property include light stocking rates, aided by contour-furrowing wherever practicable, in an effort to gain adequate vegetative cover on formerly eroded hills, and improvement of pastures on the lesser slopes. The improvement has been carried out by the introduction of subterranean clover with superphosphate, on country normally supporting a fairly heavy growth of wire grass, which is typical of a large portion of the country in the immediate vicinity.

Mr. R. H. Threlfall is progressing with his programme of breaking up new country and sowing down grasses and clover with a cover crop. In some paddocks where superphosphate had been applied for several years, and the resultant pasture had become clover dominant, a crop of oats has been

taken off and Wimmera rye grass introduced at the time of seeding.

The entry of Mr. C. R. Barton was unique in that he was the only competitor to exhibit an orchard conducted as a commercial proposition. Situated at the foot of steep granitic hills and on a sandy loam, the trees have been planted in blocks, the rows of which follow the general contour and all cultivations are on the contour.

One-way working has resulted in satisfactory banks being formed with pasture strips between each row of trees. These banks, pasture strips, and the sandy nature of the soil should control the water that falls on the area without danger of "run off".

The property of Messrs. M. R. McIntosh and Son was again up to its usual high standard, carrying both stud sheep and cattle and a good vegetative cover over all the portion of the property where the erosion hazard is high. Ample fodder reserves were provided to maintain the condition of stock and at the same time preserve the required grass cover where erosion would otherwise take place.

Mr. B. D. Brady is another competitor who has recently embarked on a plan of pasture improvement. A paddock of ten acres formerly carrying "clover" was sown to phalaris tuberosa and an excellent strike followed. Reasonable treatment during the ensuing twelve months should produce a pasture of good quality and composition.

Special attention has been paid to fodder conservation by Mr. C. M. H. Chomley on his "Killeen" property. Some good quality lucerne hay has been pressed and stored. Diversion banks have been constructed in an old cultivation paddock to control formerly active scours, and these demonstrated the advantages to be gained with this type of treatment.

Mr. N. J. McKendrick has done a noteworthy job in the management of his property. The topography is such that pasture improvement is difficult and native

grasses provide the bulk of the grazing. Controlled stocking rates and constant attention to rabbits have kept the property in good condition.

A very interesting piece of country was inspected during the judging of the entry submitted by Mr. K. Stribling, of Euroa. The paddock contains a granite outcrop, known locally as the Flat Rock, merging into moderate slopes and finally into relatively flat country. Some four years ago an area of 30 acres was contour-furrowed for the immediate purpose of controlling the run-off into a very active scour. The land between the furrows was later "sun-pronged" and sown to clover. A most satisfactory sole of grass and a good balance has resulted and the headward erosion of the gully checked.

More recently a further area of 180 acres has been furrowed; growth here has been prolific, but as yet it lacks the quality and sole of pasture of the earlier furrowed section. The flat section of the country, previously growing wire grass, has been disc-ploughed and sown to clover. Mr. Stribling pointed out that a spring located within the earlier furrowed section which had ceased to flow about twenty years ago, again became active soon after the operation of furrowing, and has flowed strongly since.

YEA SHIRE

Careful attention to stocking rates and the extensive use of contour-furrowing have given a satisfactory vegetative cover on the property of Mr. P. J. George, of Strath Creek, and the Yea Shire Council trophy has been awarded to this landholder. The property is capable of high production, but the existing shortage of fencing material has prevented very necessary subdivision. This has increased the management problem and makes more creditable the satisfactory soil protection achieved by Mr. George.

Mr. H. C. Gordon, of Murrindindi, has maintained the cover over a large amount of country by judicious grazing of the hills, and the development of the flats to high production. A demonstration area of contour-furrowing and of diversion of water from a gully head shows good results.

Messrs. W. E. D. Robinson and L. C. Hollis are two new settlers in the Yea Shire and have properties where ample scope exists for improvement and the practice of soil conservation methods.

OTHER SHIRES

An extensive programme of pasture improvement has commenced on the property of Mr. C. G. Halpin, Broadford. Bayonet-grass country is being cultivated with a heavy disc plough, subterranean



Gully control in the Yea district. The light-coloured diversion bank turns away from the gully, water from the catchment to left, and disperses it on safe ground. A second catchment, upper right, has been contour-furrowed to prevent run-off.

clover being introduced with a first crop of oats. A tunnel-eroded area has received special attention. It has been ploughed to the full depth of the tunnels, and small diversion banks have been constructed across the lines of tunnels to divert the water that falls on the area to safer places.

Further progress has been made on the property of Mr. S. Shelton at Avenel. The advantages to be gained by contour-furrowing and diversion of excess water are most obvious. A marked increase in vegetative cover with a spread of subterranean clover is improving the country beyond a state considered possible by the owner a few years ago.

Mr. N. A. E. Johnson, of Tallarook, was another competitor to exhibit a property where extensive use has been made of contour-furrowing. One paddock, known previously to the writer to have suffered severely from sheet erosion, and to have supported little but onion grass, has been completely transformed by furrowing, sowing with subterranean clover and Wimmera rye grass and regular top-dressing.

Where the land has been suitable, Mr. Johnson has carried out normal cultivation operations and sown subterranean clover and rye grass with oats, and contour-furrowed immediately afterwards. The farm management plan has been to improve the property wherever possible by the introduction of better grass species and so reduce the stocking on the hazardous country without loss in carrying capacity.

The farm of Mr. E. C. L. Head is noted for its production of Tallarook subterranean clover seed. This is produced on river flats where the erosion hazard is not serious. However, serious sheet and gully erosion had occurred on sloping land on another section of the property, and strenuous endeavours have been made to effect control. One hundred acres of contour-furrowing has been completed and several banks constructed to turn water from gully heads and other dangerous areas.

Mrs. I. D. Green on her mixed farm at Violet Town has introduced the contour principle for the control of run-off, and the results are striking. Mr. R. J. Wilson,

another Violet Town competitor, has done excellent work on some very active scours on most difficult country. The work has been materially aided by careful stocking of the hills, and the increased growth and cover has assisted in the control of the gully-heads and handling of excess water.

Mr. G. C. Wall, of Earlston, has tackled some difficult jobs on "tunnelled" country. The general method has been to plough-in the tunnels and then contour-furrow. This treatment has proved satisfactory; the main disadvantage is that the recovery is slow. Mr. Wall now favours the idea of ploughing-in the tunnels with a rooter-type plough, cultivating the whole field, and sowing two successive cereal crops. Rather amazing yields have been gained, and, in each case, the crop has been stripped and the stubble retained. After the second crop, pasture will be sown down and the area furrowed on the contour.

Mr. J. H. Ross, the only competitor in the Mansfield Shire, has a very attractive farm, where ample vegetative cover has been maintained and the shade provided is both adequate and picturesque. The demonstration area of contour-furrowing on the property has been well tended and the results have been most encouraging.

Messrs. G. G. Foletta and Son, of Buxton, have a highly-improved property on which stud Ayrshire cattle and Large White pigs are bred. The bulk of the property is on flat country and suffers no serious erosion hazard, but careful thought is given to maintaining the fertility of the soil in order that production may be kept at its present high level.

Messrs. G. W. and J. P. Raws, of Cathkin, by controlled stocking rates, have greatly increased the vegetative cover on a comparatively large property. Pasture improvement is also included in the plan of management. The actual site chosen for sowing included some small gullies, which have been filled and protected by a small bank. The new pasture should give adequate protection. A well-planned dam has been constructed across a large active scour. The head of the scour has been protected by diversion and the dam provides an excellent water storage.

(continued on page 367.)

LIVE STOCK NOTES

Compiled by A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

PURE-BRED BULL DISTRIBUTION PLAN

DURING 1947-48, 169 pure-bred bulls were sold through the Pure-bred Bull Distribution Plan to dairy farmers who were not in a sufficiently strong financial position to purchase a pure-bred bull direct from a breeder. Most of the applicants were persons who had recently gone into dairy-farming and were financing the purchase of their farms by mortgages. A big proportion of these applicants were discharged servicemen.

High-class bulls of all breeds, with the exception of Guernseys, were readily available during the year. Although many of the bulls offered were from cows which had just completed their records as junior 2-year-olds, the average butterfat production of the 169 dams of the bulls sold through the plan was 413 lb. The numbers of bulls allotted from dams in the different production groups are as follow :—

	Number of Bulls.
Dams producing under 300 lb. of butterfat	12
Dams producing 300 lb., but under 400 lb., of butterfat	63
Dams producing 400 lb., but under 500 lb. of butterfat	73
Dams producing 500 lb., but under 600 lb., of butterfat	19
Dams producing 600 lb. or over ..	2
Total	169

The plan is for the distribution of bull calves. However, bulls of serviceable age are frequently made available, and last year the average age of all calves allotted

was nine months. The numbers of bulls in the various age groups were as follow :—

	Number of Bulls.
Bulls under 3 months old	16
Bulls, 3 months old, but under 6 months old	44
Bulls, 6 months old, but under 9 months old	23
Bulls, 9 months old, but under 12 months old	18
Bulls 12 months old	34
Bulls over 12 months old	34
Total—average 9 months old	169

The greatest demand has been for Jersey bulls, but last year larger numbers of bulls of other breeds were distributed. The number of bulls distributed, the average age of the bulls, and the average butterfat production of the dams of the bulls of each breed were as follows :—

	Number of Bulls.	Average Age.	Average Butterfat of Dams.
		months.	lb.
Australian Illawarra			
Shorthorn	9	8	362
Ayrshire	11	14	397
Dairy Shorthorn	16	6	393
Friesian	11	9	444
Guernsey	2	4	442
Jersey	111	10	424
Red Poll	9	5	372
Total	169	..	..
Average	..	9	413

Full particulars of the plan may be obtained on application to the Superintendent of Live Stock, Department of Agriculture, Melbourne, C.2.

STORE STOCK CONCESSIONS ON RAILWAYS

The Railways Commissioners have notified the Department that they are concerned at the number of applications for Store Stock Concessions which are being forwarded after the rebate period has elapsed. The Victorian Railways regulations provide that applications for a rebate to store rate must be sent to the Live Stock Agent, Spencer-street, Melbourne, within six months from the date of delivery of the stock at the destination station. The Commissioners urge all applicants for the concession rate to make their applications within six months, otherwise it will not be possible to grant a rebate.

LIVE STOCK STATISTICS FOR VICTORIA

The live-stock statistics for Victoria shown in the accompanying tables have been released by Mr. O. Gawler, Victorian Government Statist.

As the result of reduced horse breeding, the decline in the number of horses has continued, and, at 221,454 head, the number is less than half the 1915 figure when there were 552,053 horses in Victoria. There is no indication of an increase in the horse population occurring in the near future.

Dairy cattle increased by 64,751 head during the year, due largely to the big increase in heifers over one year old. In 1947, there was a big increase in the number of calves reared, and this increase is reflected in the number of yearlings now on farms. This year the number of calves reared is over 2,000 less than the previous year.

Beef cattle show an increase in all districts, and, along with sheep, the numbers represent a good recovery from the low figures at March, 1946, following the drought.

Sheep numbers show that over 9,000,000 ewes have been mated, and that the

DAIRY CATTLE NUMBERS IN VICTORIA, 1943-48.

	31st March, 1948.	31st March, 1947.	31st March, 1946.	31st March, 1945.	31st March, 1944.	31st March, 1943.
Milking cows	639,079	646,823	629,046	591,437	611,599	642,110
Dry cows	257,807	230,382	182,353	267,763	263,197	235,054
Springing heifers	78,452	78,935	71,247	66,107	63,688	} 247,374
Other heifers	220,122	174,196	200,855	201,158	211,317	
Calves	243,613	245,783	181,170	202,258	218,970	281,512
Bulls	37,316	35,509	35,098	35,479	37,257	39,480
Total	1,476,379	1,411,628	1,299,769	1,364,202	1,406,028	1,455,530

LIVE STOCK STATISTICS FOR VICTORIA, 1943-48.

Horses	221,454	227,164	232,473	253,782	277,662	292,534
Dairy cattle	1,476,379	1,411,628	1,299,769	1,364,202	1,406,028	1,445,530
Beef cattle	697,824	648,433	527,318	538,908	607,005	577,362
Total cattle	2,174,203	2,060,061	1,827,087	1,903,110	2,013,033	2,022,892
Pigs	271,492	290,450	271,887	296,232	337,878	307,929
Sheep	17,931,173	16,598,490	14,655,277	16,457,101	19,220,457	19,614,040

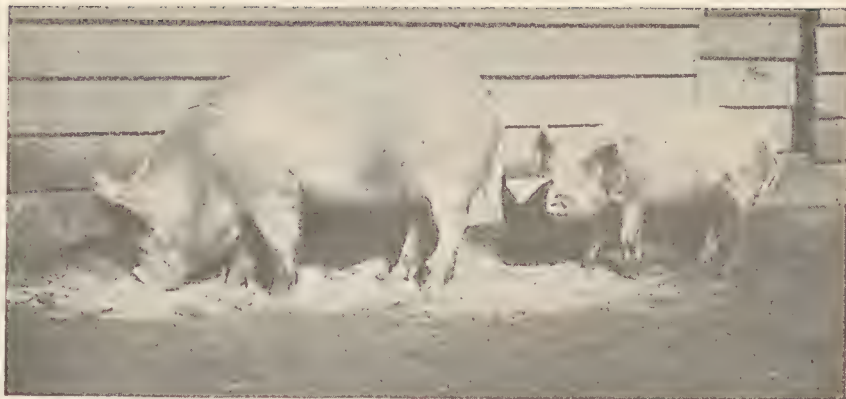
proportion mated to rams of the British breeds is high, which would indicate that, although wool prices are buoyant, fat-lamb production is increasing, with no tendency of graziers to swing solely to wool production. At 17,931,173, the sheep population is still below the record number of 20,598,201 in 1942. The Western District carried 5,664,641 sheep during the year. Numbers in the Mallee, Wimmera, and northern districts are still much below pre-drought levels, and will probably remain down while wheat prices hold and the cost of breeding stock is high.

THE PROBLEM OF THE RUNT PIG

A runt is an animal which is backward when compared with its mates.

The constitution of a pig is influenced by two factors; its heredity and its environment. The heredity of a pig cannot be influenced directly by the farmer after the parents have been selected. If the percentage of runts born is high, the farmer is well advised to select new breeding stock. The pig is multiparous in that it produces more than one offspring at a time. It is possible to have great variations between the piglets of one litter, because each piglet born is the result of the fertilization of one of the many eggs (ova) which are shed during each heat period by a single sperm-cell. The ova shed by the sow and the sperm cells produced by the boar are all different in their genetic make up.

Environment begins to have an effect immediately the piglets are conceived, though, before birth, external influence is more likely to affect each piglet equally, and it is its genetic make-up which determines how it will develop in comparison with its litter mates during pregnancy. After birth, size plays a very important part as the larger piglets almost invariably manage to get the breast teats, which are



The runt is from the same litter as its mate. Both are seven months old.

the most productive, while the smaller and weaker pigs get pushed towards the back teats.

Because a pig is smaller at birth it does not always mean it will continue to be small, consequently, if the litter is large, the provision of some supplementary food very early in the life of the piglets will often result in a uniform and satisfactory weaning weight, whereas, without this provision, a litter may soon degenerate into a group of good pigs obtaining sufficient nutrients from the sow, and a group of runts, the majority of which are the result of under nutrition. The poor pigs are the ones which would probably make all the difference between a good profit and a bare margin. It is always worth the trouble to provide supplementary feed for the young pigs in a creep. These small, weak pigs are also more likely to become infected with disease, and, once infected, may transmit the disease to the stronger ones.

Anaemia is a disease commonly seen in young pigs. Generally this complaint can be prevented easily, but it is difficult to cure once it has set in. Young pigs reared on pasture seldom suffer, but pigs bred on concrete are very prone to the complaint if they are not supplied daily with fresh soil to nose into.

Should Runts be Destroyed ?

The most economic pig is one which is given sufficient food to enable it to grow quickly to pork or bacon weight, and, if

adequate food is given and the other environmental conditions are reasonable, there will be very few runts. The occasional pig which does not grow satisfactorily under good conditions is best disposed of before too much food and time are wasted on it.

[A. D. NORTH, B.Agr.Sc.,
Science Field Officer.]

TUMOURS OF THE HORSE'S EYE

Tumours may be either benign or malignant, that is, either slow-growing superficial growths or those which grow rapidly, tend to ulcerate, and eventually extend into deeper tissues. Tumours on the eyelids seem to be commonest in light-coloured (washy) bays or light chestnuts with plenty of white hair around the eye. Grey horses, on the other hand, often develop small black warts on the lids.

The first sign may be a small reddened patch on the inside of the lid. This patch will gradually extend to perhaps the size of a grain of wheat. A tumour of this kind is of the Epithelioma type, and will continue to grow and cause a noticeable deformity of the eyelid. Eventually it may extend across the surface of the eye or send roots into the muscular layers of the lids and finally involve the bone or perhaps the eyeball itself.

When buying a horse, always examine the insides of the eyelids, particularly if the animal has much white about its face. The only treatment is to remove the tumour surgically.

Small warts with thin stalks can be snipped off with scissors or the stalks ligatured with silk thread and allowed to drop off. These warts are usually benign, whereas the Epithelioma is often malignant and, in advanced cases, may spread to the glands of the neck.

The Dermoid is another type of growth sometimes present at birth, and consists of a fleshy growth involving the surface of the eyeball. It is often surmounted by long hairs which continually irritate the surface of the eye and the lids. The long hairs can be seen protruding between the eyelids which cannot completely close, and there is often a constant flow of tears. The Dermoid can be removed surgically, but, if unchecked or not completely removed, it may spread over the whole of the front of the eyeball, causing blindness.

[H. TUCKER, B.V.Sc., Veterinary Officer.]

INCUBATION OF EGGS

The modern incubator is easy to operate and has greatly simplified incubation. With temperature, ventilation, and humidity under almost perfect control, excellent results are obtained provided suitable eggs are used and a few simple rules are followed. Incubators are rarely to blame for poor hatches, as factors such as condition of breeding stock, feeding, housing, external and internal parasites, heredity, &c., must be considered.

Eggs laid by birds in poor condition and birds that continue laying without moulting rarely produce chickens. Red mite, body lice, worms, and other parasites lower the condition of birds, while pullorum disease is a frequent cause of infertility.

Breeding stock should be culled at least twice each season, as remarkable changes take place during the moulting period—some birds lose condition, others become overfat, and it is not uncommon to find abdominal tumours and cysts which were not noticeable during the early culling. All breeding stock should be blood-tested for pullorum disease.

The conditions inside the incubator room have an important bearing on hatching results, as the low moisture content of the atmosphere associated with low temperatures causes excessive evaporation inside the egg during incubation. The most desirable room temperature is 60 to 70°F., as this usually allows the correct degree of humidity to be maintained in the machine without having to open or close incubator air-vents too much.

The relative degree of humidity should be approximately 50 to 60 per cent. Air at 70°F. supplies twice as much moisture when it enters the machine as it would at 50°F., provided the air was saturated in each case, but it is not usual for air to be saturated at these temperatures. As warm, dry air causes rapid evaporation, moisture should be provided in the incubator room when temperatures above 75°F. prevail. Both the incubator room and the incubator should be sufficiently well ventilated to provide ample fresh air containing sufficient oxygen to supply the requirements of the embryo chick.

The fresher the eggs the better they hatch out. Eggs intended for incubation should be packed small end down and

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1 gallon to 250 gallons water = 0.1% D.D.T.

EASY TO MIX... EASY TO USE

RULENE is the answer to the growing demand by commercial growers and home gardeners for a highly efficient and economical spray that mixes easily in either hard or soft water, and can be used in combination with various fungicides such as Lime Sulphur, Bordeaux Mixture, Copper Sprays, &c. RULENE, containing 25% D.D.T., does all these things speedily and efficiently, and is the most economical spray concentrate available.

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DIRECTIONS FOR USE

The correct proportions for making up RULENE SPRAY is one gallon of RULENE to 250 gallons of water. First mix equal quantities of RULENE and water and stir into a thin cream; fill the vat or drum with the required quantity of water and then pour in the cream, stirring thoroughly all the time. Only make up sufficient quantities for immediate use.

44 gal. drums	26/9 gallon	1 gal. drums	29/6 gallon
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turned regularly during storage. They are best kept at a temperature of approximately 45°F., and held for no longer than eight days.

Keep hatches on time and do not help late-hatched chicks out of the shell. Candle all eggs intended for incubation, and use only those weighing 2 oz. to 2½ oz. Very large eggs do not hatch as well as those of standard size, while small eggs are undesirable, as egg size is an inherited characteristic.

Incubators give best results when filled to capacity, and faults at the beginning of the season are often due to partly-filled machines. When placing additional eggs in the incubator it is an advantage to pre-warm them, as cold eggs sometimes have a harmful effect on developing embryos.

[M. D. HALL, Poultry Expert.]

BEE-KEEPING

Under the Bees Acts it is necessary for all persons who keep more than two hives to register on a form obtainable from the Chief Veterinary Inspector. Those persons who keep more than five hives must pay a fee of 5s. per year.

Apiarists living in adjoining States are liable for registration and fees as soon as they migrate to Victoria. Registration is due on or before the 30th June of each year.

During 1947-48, one apiarist registered 1,050 hives; while 1,149 apiarists registered six hives or more.

The following figures setting out the number of apiarists in Victoria, together with the number of hives, may be of interest to bee keepers:—

Size of Apiary.				Number of Apiarists.
6 to 20 hives	..	..	..	312
21 to 49 hives	..	..	..	268
50 to 99 hives	..	..	..	241
100 to 199 hives	..	..	..	190
200 to 249 hives	..	..	..	54
250 and over	..	..	..	84
Total	..	..	..	1,149

Most apiarists are centred round the Grampians, and the shires of Stawell with 80 apiarists, Wimmera with 69, and Ararat with 42, have the highest registrations. In the Melbourne metropolitan area 112 apiarists are registered, but most of these are migratory.

SOIL CONSERVATION—Competition in the Goulburn Catchment

(continued from page 362)

A satisfactory drop structure has been erected in a scouring gully on the property of Messrs. L. J. Webster and Son. Lengthy diversion banks, to intercept run-off water from the hills and convey it into the structure, have been formed. In this way the fingering of the sides of the gully is also controlled. Active erosion had been occurring on the banks of the Acheron River

which passes through the property and some effective work has been done with willows. The banks at the time of inspection appeared to be quite stabilized.

In conclusion, the writer desires to express his appreciation to competitors, shire councillors and officers, and to members of Regional Advisory Committees for their assistance in the conduct of the competition.



THE VEGETABLE GARDEN

By George Hyam, Horticultural Supervisor

EARLY SOWINGS OF ROOT CROPS

THE fully-matured roots of any swedes, carrot, parsnip, or beetroot should be lifted and stored before the end of this month, as they are apt to develop seed stems in September, and these toughen the cores to an unpalatable degree. Carrots, parsnips, and swedes can be stored away in boxes of sand if the quantity is small, otherwise they are best stored in "clamps" built as shown in the illustration. Red beet does not store well in clamps, but will keep for some weeks in sand. Roots for storage should be carefully lifted so that there is no breakage or even an abrasion of the skin, as these will allow rots to enter, and one rotten root may in turn spoil the remainder unless it is promptly removed. Successful storage also depends upon cutting off the foliage right down to the crowns but the crown itself must be left intact. For clamps, each layer is embedded in dry sand or wood ashes and the pile should be steep to shed the rain. The layer of straw is necessary for ventilation.

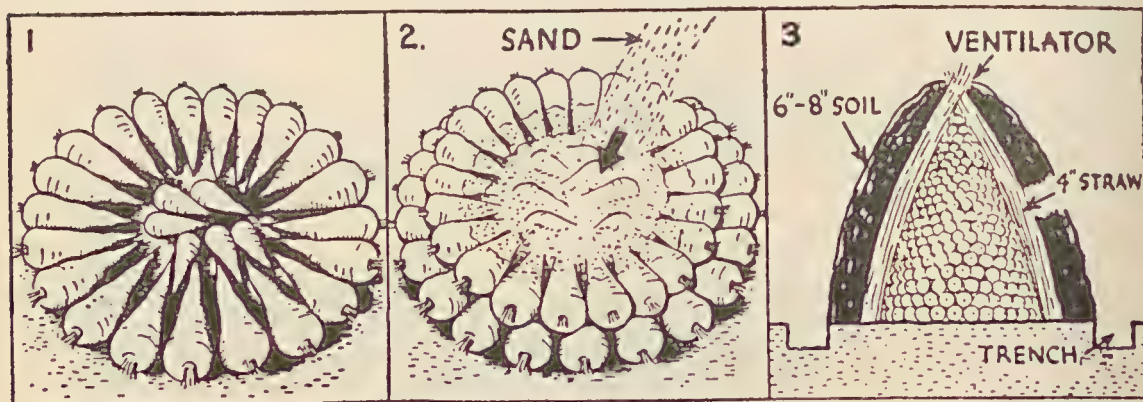
To provide for carrots, parsnips, and beet before the main November-December sown crops come in, a small sowing of each should be made in August. These will be ready for use in November and could be followed by summer crops. All root

crops do best in beds which have been heavily manured for leaf crops, and, if sown thus, only need a light dressing of superphosphate. In poorer soil it is advisable to rake in 2 oz. to the square yard, rather deeply, and 1 oz. just under the surface.

The best carrot variety for this sowing is "Osborne Park" which has a remarkable degree of resistance to virus, and, on account of the prevalence of its carrier, the carrot aphid, virus is at its worst in spring. It is advisable to dust the plants with nicotine or DDT dusts as soon as they appear as the aphid themselves can seriously damage young carrots. In the heavier soils that are likely to cake, carrot seed is best covered with sand, sawdust, or well-rotted manure, as their germinating shoots are very tender. Shallow sowing is also necessary—not more than $\frac{1}{2}$ inch deep in heavy soils to $\frac{3}{4}$ inch in light sands. The same sowing depths can be used for parsnips. Beetroot is sown a little deeper—from $\frac{3}{4}$ inch to 1 inch.

THE SALSIFY OR OYSTER PLANT

For those who like variety in vegetables, the easily-grown salsify is recommended, as its flavour is quite unlike any other.



1.—Roots stacked in circles on a bed of clean sand. 2.—Each layer is embedded in sand. 3.—Section of finished clamp. The layer of straw protruding through the top is essential for ventilation.

[After Min. of Agr. and Fish.]

Its habit is similar to that of a parsnip and its roots are used either separately or in combination with other roots for similar dishes. It derives its common name from its flavour which resembles that of oysters, and, consequently, makes an attractive soup.

August to September is the best time for sowing under the same soil conditions as for parsnips in a deeply-dug soil which has been well manured for the previous crop with just a light dusting of superphosphate along each side of the seed row, 2 inches away from the seed. Salsify prefers light soil. As it is rather slow in growth, taking six months to mature, it is better sown in a bed which will not be needed for summer vegetables. Salsify will store in the ground for at least twelve months in perfect condition for use. Shallow sowing at a depth of not more than $\frac{1}{2}$ inch is necessary, otherwise germination may be affected.

There are several varieties but the Mammoth is the most readily obtainable. A closely-allied root—the Scorzonera or Black Salsify—which is grown in the same way, provides another flavour which is sweet and similar to that of the parsnip.

ARTICHOKES

Both Jerusalem and Chinese artichokes should be lifted and replanted every year, August being the best time to plant both. These plants will grow in any soil, in any position, and form a useful windbreak to protect the summer vegetables. Pig-raisers will find good use for Jerusalem artichokes for winter feed, and could well plant a quantity of them round the boundary of the vegetable garden for both purposes as well as for domestic use. The tubers should not be planted deeper than 6 inches in light soil or 5 inches in heavy types, otherwise the tubers will be small. Spacing in the row should not be less than 18 inches. A dressing of 1 oz. to the square yard of 4 to 1 superphosphate and ammonia should be applied at the time of planting. The seed of Globe artichokes or their rooted suckers can be planted in August. Globe artichokes grow into a large plant and the immature flower heads are used, forming a delicious vegetable when properly cooked. The plant itself is quite ornamental and

not out of place in the flower garden.

About two matured plants are sufficient for the average household. Space them at least 3 feet apart.

OTHER AUGUST PLANTINGS

The last sowing of broad beans is made this month, and growing crops of these beans should be watched for the presence of bean aphid. A dusting of DDT or nicotine should be applied at the first sign. Potatoes can be planted in all but the coldest districts and can be lifted in time to follow on with beans. August is the month for the main sowing of Greenfeast peas, and make a good crop to sow on beds to be afterwards planted with mid-season tomatoes. There is still time to plant out seedlings of late onions and a small seed row of any early white variety will provide spring onions for salads during the late spring and summer. Asparagus seed is now sown in drills in a seed bed $\frac{3}{4}$ inch deep to provide plants for future planting. All herb seeds can be sown in August, and parsley sown now will provide a supply for twelve months from November when the first pickings can be made. Parsley is slow in germination, and, in order to mark the row, a few radish or turnip seeds can be mixed with its seed to facilitate weeding.

Tomato seed can be sown in most districts. For home gardens needing only a few plants, the handiest method is to sow in 5-in. flower pots which can be kept in a warm place such as a window sill until they come to the pricking-out stage. Sow about twenty seeds to the pot and prick out into separate tins or pots when the first seed leaves are fully developed. All the vine vegetables can be started by sowing two seeds to a tin or pot, afterwards allowing the best plant to grow on until October before planting out. By planting out these advanced pot-grown plants, their period of fruiting is lengthened, particularly in southern areas.

In the seed bed, or in boxes, seeds of kale, sprouting broccoli, and Chinese cabbage can be sown to provide a few plants of these summer green vegetables. Kale sown in August will yield from October until the following spring.

THE FLOWER GARDEN

By T. H. Kneen, B.Agr.Sc., Principal, School of Primary Agriculture and Horticulture, Burnley Gardens.

ROSE growers are advised to watch carefully for any sign of aphid infection on the tender young growths which will appear on their plants during the next few weeks. Heavy aphid infection can severely check the whole rose plant, and such a plant cannot be expected to produce good blooms.

Nicotine sulphate or DDT sprays can be used with good effect on aphids. The former is best used on a warmish day, and soft soap added will increase its penetrating power. No matter how good the insecticide may be, it is very desirable to use an efficient sprayer to apply it. Excellent continuous atomizers holding a pint or more of spray mixture are available or, for larger gardens, stirrup or bucket pumps could be used.

HERBACEOUS PERENNIALS

Herbaceous plants such as Delphinium, Canna, Shasta daisy, Perennial Phlox, and others can be divided and planted out in well-manured ground. Good feeding will encourage rapid and generous growth. In addition to those mentioned, the following are a selection from the hundreds of herbaceous perennials which might be grown:—

Heuchera

The slender graceful spikes of Heuchera are prized for use in flower arrangements. Unlike many herbaceous perennials the foliage remains in good condition during the winter months, and for this reason Heuchera can be used effectively as a permanent edging to borders. The plants are readily raised from seeds. Named varieties are best increased by division of clumps in autumn or spring. The plants attain a height of 1 to 2 ft.

Hemerocallis (Day Lily)

The modern Day Lily is a showy border plant of easy culture, bearing trumpet-shaped lily-like flowers. Further, it is useful for cutting, as the flowers are fragrant and the buds continue to open after the spikes

have been cut. Various colours are available, mainly in the yellow-orange range, but there are also apricot and buff colours with shadings of brown, red, and pink.

The Day Lily grows to a height of 2 or 3 ft. and can be strongly recommended for any garden as a plant giving good return for little effort.

Aster (Perennial)

For many years now the perennial aster or Michaelmas Daisy has been a favorite in the flower border. Few flowers are valued more for cutting for vase decorations. Many of the taller sorts grow to a height of 6 ft., and can take a place in shrubberies. Many people have borders consisting wholly of perennial asters, making full use of the available range in size and colour (tints and shades of white, pink, and purple).

Like many perennials, they respond well to good soil preparation and liberal manuring, particularly if the soil is light and sandy. The vigorous sorts will stand dividing each year, and the taller sorts, staking to show them off to best advantage.

Division of the clumps during the dormant season is the usual method of propagation. It is sometimes desirable to thin out some shoots in the spring if the plants are likely to be too crowded. Cuttings of these young shoots will root readily enough if inserted in pots of sandy soil in a cold frame, after which they can be potted, and in due course planted out. Seedling plants will vary from the parents, but good seedlings can be perpetuated by division or cuttings.

Astilbe (Goat's Beard)

The Astilbes are plants growing to about 2 ft. in height, bearing feathery plumes of pink, white, or purple flowers. They will grow in most soils and deserve consideration in semi-shaded positions.

Again the usual method of propagation is by division of the roots. Increasing plants by simple division must appeal to the amateur, who finds little time to raise

seedlings, which for so many herbaceous perennials becomes justified only if it is desired to raise a new sort.

Aquilegia (Columbine)

An old favorite, the Columbine combines a graceful habit with delicate flowers and the capacity to thrive in both sun and shade. Amongst the several species cultivated is *A. coerulea*, with long-spurred pale-blue and white flowers.

However, the most popular columbines are those known as Long-spurred Hybrids, which are normally obtainable in a wide range of separate colours.

Propagation is effected by division of the clumps, particularly if it is desired to keep the sorts true. For ordinary garden decoration and cut flowers, seedlings are perfectly satisfactory and may be raised from seed sown in the autumn or spring. Plants attain a height of 1 to 3 ft. and should be planted 12 to 18 inches apart.

As a matter of interest, the long-spurred hybrids originate mainly by crosses between three American species, which are characterized by long, straight spurs 2 inches or more in length. Species of the old world are characterized by short incurved spurs.

WHEN CAMELLIA BUDS DROP

Reports are frequently received of flower buds of such valued plants as camellias, when apparently healthy, dropping or failing to open. Of the many environmental factors

likely to contribute to such an occurrence, temperature is probably one of the most important. It is, therefore, not evading the question to say that the failure of the blossoms to open is "due to seasonal conditions".

Blossom-bud formation in the camellia takes place some five or six months before the actual flowering, that is at the height of the summer. In general, it can be stated that the process is favoured by high temperatures, while the low temperatures experienced in the winter months favour flower opening. In processes of this kind there is usually an optimum or most favorable temperature, above or below which the process does not proceed so well. Excessively high average summer temperatures might conceivably depress very severely the initiation of blossom buds and so on. The variable nature of our climate means that optimum conditions may occur rather infrequently. Averages of climatic records are frequently meaningless unless the degree of variation from the mean is also taken into account.

This is not to say that the absence or over-abundance of some plant food, for example, might not be the cause of the trouble. If this could be established, it would be possible to take some corrective action. All too often perfectly healthy plants are upset by a "shot in the dark" treatment of the soil, when quite possibly the real cause of the failure of camellia blooms to open was beyond control.

Illegal use of Milk Cans

Complaints have been received by the Department of Agriculture that some dairymen are using farmers' milk cans for purposes other than the transport of milk from farm to dairy. When such complaints are being investigated by officers of the Department, however, it is often difficult to establish ownership of cans, because the farmer's name is not always legibly marked on them.

Under the Milk and Dairy Supervision Act, the owner of any can used in the supply of milk to the metropolis, must legibly stamp his name and address on the can in letters at least $\frac{1}{2}$ inch in height. It is an offence for persons other than the owner to use milk cans for any purpose whatsoever. But, before action can be taken against dairymen and others for the illegal use of cans, these must be correctly marked so that ownership may be established.

Farmers may co-operate by having their cans marked clearly as indicated. It may become necessary to take action against those farmers who do not mark their cans correctly, in order to protect the interests of those who do.

[Contributed by the Dairying Division.]

TUBERCLE-FREE HERDS

ACCREDITED TUBERCLE-FREE HERDS

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd
Aboriginal Station ..	Lake Tyers ..	86	Longerenong Agri. College	Dooen ..	30
Ampt, E. W. ..	Gymbowen ..	12	Luke, K. G. ..	Romsey ..	32
Ampt, N. C. ..	Gymbowen ..	21	Maloney, P. J. ..	Tongala ..	66
Ballarat Orphanage ..	Ballarat ..	139	Maybery, A. H. ..	Mitre ..	11
Banyule Stud Pty. Ltd. ..	Wangaratta ..	55	Middleton, J. A. ..	Labertouche ..	80
Beggs, A. R. ..	Beaufort ..	97	Moore, J., and Co. ..	Yarram ..	88
Black, I. S., Estate of ..	Mount Noorat ..	64	Murray, M. G. ..	Lima ..	19
Bleakley Bros. ..	Horsham ..	18	McIntosh, J. ..	Merrigum ..	44
Bott, J. ..	Yarrowonga ..	70	McKenzie, A. E. ..	Kerang ..	54
Bruhn, C. H., and V. I. ..	Mirboo North ..	54	McKenzie, Mrs. E. J. ..	Woodford ..	81
Candler, G. E. ..	Hamilton ..	35	McKenzie, H. P. ..	Trawalla ..	15
Carne, W. J. ..	Pakenham Upper ..	30	McNabb, G. A., and Son	Irrawillie East ..	196
Cason, J. M. ..	Lima South ..	55	Nancarrow Bros. ..	Kerang ..	56
Clark, W. J. ..	Monometh ..	148	Newton, J. M., and Sons	Whorouly ..	110
Cowan, G. L. S. ..	Bacchus Marsh ..	59	Nicholas, M. A. ..	Sherbrooke ..	79
Cox, F. G. ..	"Birradale," South	47	Noonan, Mrs. S. A. ..	Benalla ..	68
	Lyndhurst ..		Northcote Children's Farm	Bacchus Marsh ..	83
Cribbes, T. ..	Wangaratta ..	40	Onley, W. H. ..	"Glenholme," Caldermeade ..	88
Deening, J. T. ..	South Wangaratta ..	79			
Dookie Agricultural College (Ayrshire Herd)	Dookie ..	117	Parker, Mrs. L. M. ..	Tallarook ..	67
Dookie Agricultural College (Hereford Herd)	Dookie ..	38	Payne, A. E. T. ..	"Yarra View," Lilydale ..	78
Everist, F. R. ..	Tyabb ..	12	Payne, T. E. N. ..	"Woodburn," Kilmore ..	72
Foletta, G. G., and Son ..	Buxton ..	121	Poole, M. A., and D. ..	Caldermeade ..	161
Geelong Grammar School	Corio ..	81	Poole, M. A., and D. ..	Yannathan ..	118
Gilbert, J. A. & R. D. ..	"Brookelbank," Yinnar	108	Potter, W. J. ..	Longwarry North ..	118
	South ..		Price, L. E. ..	Ellerslie ..	54
Gleeson, P. J., and Son ..	Tynong ..	261	Prosser, J. E. ..	Ondit ..	40
Gorman, A. W. ..	"Cathcart," Alexandra ..	57	Read, exors. estate I. D.	Springhurst ..	99
Griffiths, J. G. ..	Benalla ..	121	Reed, Mrs. B., Estate of	Bundoora ..	88
Gross, Mrs. G. F. ..	Horsham ..	28	Rix, A. A. ..	Officer ..	79
Hamilton, A. ..	Flinders ..	69	Roe, Thomas H. P. ..	Cobram ..	15
Henry, J. A. ..	Merrivale ..	40	Sanderson, R. F. ..	"Pleasant Hill," Kyneton	75
Howlett, Mrs. G., and Miss E. Samuel	Lang Lang ..	84	School of Horticulture ..	Burnley ..	9
Jakobi, L. W. ..	"Granda," Yannathan ..	89	Scott, F. E. Selwyn	Scotsburn ..	78
Johnson, F. G. ..	Horsham ..	34	State Experiment Farm ..	Rutherglen ..	49
Keele, H. A. ..	Bamawm ..	111	State Research Farm ..	Werribee ..	203
Kemp, E. J. ..	Horsham ..	16	Stephens, Dr. F. ..	Vermont ..	40
Kilmany Park Home for Boys	Kilmany ..	99	St. Joseph's Home ..	Sebastopol ..	57
Kingsley-Newell, F. J. ..	Shoreham ..	60	Syme, David ..	Woori Yallock ..	55
La Fontaine, G. ..	Mitta Mitta ..	61	Thomas and Taylor Pty. Ltd.	Hamilton ..	26
Lawrence, P. H. ..	"Rainga," Tarrawarra ..	82	Tucker, E. G. ..	Horsham ..	71
Lawton, W. ..	Frankston ..	56	Vagg, T. R. ..	Officedale ..	56
Light, D. T. ..	Noradjuha ..	12	Vagg, F. G. ..	Leongatha ..	57
			Warnock, J. A. ..	Lima South ..	77
			Waterhouse and Son ..	Pakenham ..	66
			Williamson Bros. ..	Carlsbrook ..	119

In addition to the above the following is a list of herds in their respective districts which have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but, inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the Accreditation Scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

District.	Herds.	Cattle.	District.	Herds.	Cattle.
Bairnsdale ..	4	109	Orbost ..	1	99
Ballarat ..	118	2,898	Portland ..	7	431
Benalla ..	43	298	Rutherglen ..	20	296
Bendigo ..	76	2,513	Sale ..	5	341
Broadmeadows ..	45	1,985	Traralgon ..	4	218
Colac ..	7	196	Wangaratta ..	37	418
Doncaster ..	18	733	Warrnambool ..	6	328
Geelong ..	89	3,111	Whittlesea ..	105	4,423
Hamilton ..	2	94	Yallourn ..	4	269
Heidelberg ..	22	738	Yarragon ..	36	1,630
Horsham ..	9	468	Yea ..	30	82
Morwell ..	3	270			

There are also 356 herds in which 15,511 head of cattle have passed one test and may be considered, therefore, to be in process of becoming tubercle-free herds.

Pin-Hole Borers of Fire-Killed Mountain Ash

The Biology of the Pin-Hole Borer—*Platypus subgranosus* S.

By T. W. Hogan, M.Agr.Sc., Senior Entomologist, Biological Branch

THE following paper was prepared from information obtained in the course of an investigation carried out on behalf of the Forests Commission of Victoria over the years 1942-1944. Observations on the biology were made in the field, and, as the need for more detailed and accurate information arose, the insects were reared in wood sections kept in an insectary at the Biological Branch, Burnley.

Platypus subgranosus was first described by Schedl (1936). In Victoria, this insect was known as *Crossotarsus omnivorus* until 1940 when specimens forwarded to H. Womersley, entomologist, were identified, from specimens in the South Australian Museum collection, as *Platypus subgranosus* Schedl. This species appears to be endemic to Australia and has only been recorded from Queensland (Dividing Range), Tasmania (Waratah), and Victoria (Central Highlands). Its biology has not been investigated previously, but, in Victoria, general field observations on its occurrence and habits have been made from time to time by officers of the Forests Commission of Victoria.

HOST PLANTS

In the area in which this investigation was made specimens were taken from Mountain Ash (*Eucalyptus regnans*), Alpine Ash (*E. gigantea*), Mountain Grey Gum (*E. goniocalyx*), Messmate (*E. obliqua*), and Myrtle Beech (*Nothofagus cunninghamii*). It is possible, of course, that it infests other

species not present in this part of Victoria, but no records of its host plants in other States has been found.

DESCRIPTION

Adults (Fig. 1)

The adults have the typical elongate cylindrical form of Platypodids. The sexes are dimorphic, the principal differences being in size and the sculpturing of the elytra. A full description is given by Schedl (1936) and only details by which the sexes can be distinguished will be given here.

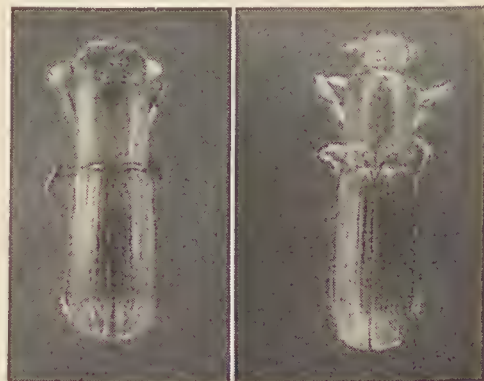


Fig. 1.—Left, adult male. Right, adult female.

MALE

Head and apex of elytra dark brown, pronotum and base of elytra light brown, legs light to yellowish. Frons punctate covered with short yellow pubescence. Pronotum elongate punctate.

Elytra finely striated, the striae commencing in the form of punctures near the base of the elytra, but continued as setose granules towards the apex. These setose granules form a triangle with the apex towards the base of the elytra and base parallel to the line of pubescence which covers the elytral declivity. Elytral declivity forming an abrupt angle with the elytral disc and junction marked by a straight line of yellow setae which cover the elytral declivity.

FEMALE

Colouration similar to male but elytra usually uniformly dark brown. Punctures of the pronotum more sparsely spaced than in the male. Triangle of setose granules absent from the elytra. Elytral declivity feebly convex, perpendicularly aplanate at apex.

Immature Stages

The eggs are elongate, oval, glistening white, and about 0.7 mm. long. They are covered with a slightly sticky secretion which causes them to adhere to one another and to the walls of the gallery. They may be laid singly or in groups of 2-8. Unless kept in air of high humidity, they will shrivel and collapse in a few hours.



Fig. 2.—Left, Pupa in pupal cell. Right, Pupa.

When freshly hatched the larvae are white, legless, flattened dorso-laterally, with a row of fleshy protuberances on either side (Fig. 3). The next instar is similar in appearance, except that it is larger, but later instars lose the flattened appearance and the tubercles along the sides. The full-grown larva is about 4 mms. long with an enlarged prothoracic segment on which four brown chitinous loops can be seen on the dorsal surface. (Fig. 3.) Microscopic examination shows these to consist of small chitinous, back-pointing bristles

which are, no doubt, an aid to locomotion in the tunnels and a means of maintaining position during the process of boring. The skin of all stages of all instars although smooth to the naked eye, can be seen, when magnified, to be covered with tiny spicules which may also be an aid to locomotion.



Fig. 3.—Left, Mature larva. Right, Immature larva, 1st instar.

By taking sections from wood of known history at various intervals of time after cessation of boring by the adult female, immature larval stages can be obtained. The amount of such wood being limited only small numbers of immature larvae have been collected and use has been made of Dyar's (1890) method of estimating the larval instars by changes in the width of the head capsule. A sample of 50 larvae of various stages of maturity were measured across the widest part of the head capsule and were found to fall into five groups.

TABLE 1.—HEAD CAPSULE WIDTHS OF LARVAE OF *Platypus subgranosus*.

—		1.	2.	3.	4.	5.
Average	Width					
Mms.	(+ .003	0.346	0.439	0.587	0.772	0.945
Calculated	Value					
Mms.	..	0.346	0.447	0.576	0.743	0.959

Dyar postulates a constant ratio between the head capsule width of each larval instar and the preceding one. Using the width

of the head capsule of freshly-hatched larvae as a starting point, a geometric ratio of 1.29 gives the series shown in Table 1.

Considering the small number of larvae the agreement is very close and it is concluded that there are five larval instars with a geometric ratio between successive head capsule widths of 1.29.

The pupae (Fig. 2) are typically exarate. They are ivory white in the early stages, but gradually darken, the mandibles becoming strongly chitinated before the remainder of the insect. Pupation occurs in special cells (Fig. 2) excavated by the full-grown larvae. These cells are usually in two rows on either side of the tunnel and at right angles to it, with the long axis parallel to the grain of wood. The pupae lie with their heads towards the tunnel from which they are separated by an accumulation of frass at the entrance to the cell.

LIFE HISTORY AND HABITS

Method of Study

Sections, taken from wood of known history, were opened up at regular intervals after certain stages had been reached. In the field, a "census" method was used by which entries in various situations were opened up by axe and examined. This process was repeated at regular intervals throughout the year and enabled seasonal occurrence of different stages, length of life cycle under field conditions, and gallery types, to be determined. Insectary studies eventually revealed that certain stages of development were indicated externally, and insectary records consist chiefly of the sub-divisions available by this method.

INSECTARY REARING

After various trials it was found that the most important measure in the rearing of *P. subgranosus* was to prevent the drying out of the wood without causing excessive humidity. Very rapid drying will take place from the ends of wood sections unless they are sealed, and a coating of micro-crystalline paraffin wax was found very effective for this purpose. Two methods (Fig. 8) of maintaining the moist content of sections were used:—

1. Coating the ends with wax; lying the section on its side in damp sand, and spraying regularly with water.

2. Coating one end with wax standing the section on end and supplying water from the top end.

Either method can be used successfully provided the section is not exposed to sunlight. With sections of large diameter end-coating alone enabled survival of the insects.

PROTECTION FROM MITES

The beetles in the first sections obtained were destroyed by mites (*Schwiebia* sp.). Protection from these mites was provided in the following way:—

(a) *General hygiene*; regular washing of benches with kerosene or spraying inaccessible corners with methylated spirits.

(b) The use of barriers of ortho-di-nitro-cyclo-hexyl-phenyl in oil and petrolatum between sections and individual entries.

(c) Constant "testing" of inactive entries. Testing consisted of placing a short length of waxed string in an entry. If alive the string was pushed out. If there was no reaction to the test, the entry was blocked up with wax, thereby preventing the spread of the mites should they be present in the entry. This latter measure was most important as the mites and mite eggs remained in the entry for some time after the death of the Platypodids and could therefore be prevented from spreading by this means.

Each entry was numbered and records kept of the type and quantity of frass produced, small trays (corrugated fasteners) being affixed below the entry to catch the accumulated frass.

When emergence was due, traps consisting of metal ferrules, with teeth cut in the wide end and wire gauze fitted into the narrow end, were placed over the entries (Fig. 8). The same traps were used for confining male beetles on wood to be infested and for "pairing" females with a male after the latter had bored into the wood.

MASS EMERGENCE CAGE (FIG. 7)

Large numbers of beetles for making tests and for infesting sections were obtained by enclosing infested wood, brought from the forest, in a wire cage 8 ft. x 6 ft. x 5 ft. Use was made of the attraction to light of *P. subgranosus* to trap the emerging beetles. At one end was a glass window, and, during the emergence season, the cage was covered with black cloth except



Fig. 4.—Pupal cells in Myrtle Beech wood.

for the window. The beetles flew to the light and then dropped through a hole below the window into a container.

Beetles could be left alive for long periods after emergence by placing in damp sawdust and keeping in cool conditions.

Life Cycle

ADULT FLIGHTS

In the Central Highlands of Victoria, where this study was made, emergence commences in October, and continues till the end of April. The largest flights were observed in January and March, but there are no definite broods. Flights do not occur on wet or cold days in summer, but odd beetles may emerge, just as occasional individuals may be seen on warmer winter days. Emergence on suitable days shows a pronounced periodicity. The males emerge late in the afternoon and for this reason as well as the fact that they are the first to alight on susceptible wood, are more commonly seen than the females. The latter emerge in the early morning and are usually inside the wood before midday. The flight of both sexes is weak and slow.

CONSTRUCTION OF THE GALLERY

The initial entry into the wood is made by the male which penetrates to a depth of about $\frac{1}{2}$ inch in a few hours, the rate varying with the temperature. The male then waits at the entrance of the tunnel for the arrival of a female. The latter, after alighting on a log, moves over the surface in search of a tunnel occupied by a male only. Apparently there is some chemotropic attraction by which the male can be located, as each female moves directly

from tunnel to tunnel and does not appear to reach them by chance wanderings. She is unable to distinguish between paired and unpaired males except by the reaction of the male. Where a female is already present, the male moves inward from the entrance, whereas an unpaired male shows considerable agitation when touched by the mandibles of the female, and, after constant caressing, is enticed to leave the tunnel, whereupon the female enters the gallery and the male

returns after her. Copulation has been observed to occur prior to entry into the tunnel, but only rarely. The species is monogamous.

Further excavation of the gallery is then carried out solely by the female, the male spending most of his time near the entrance. After a variable period (see "length of life cycle") excavation ceases and oviposition commences. Eggs are laid, usually near the end of the gallery, in groups of one to six, and over a prolonged period, so that both eggs and pupae may be found in the one gallery, but most eggs appear to be laid in spring and autumn.

The total number of eggs is small, and it is seldom that more than six to ten eggs are found in one gallery at any one time. This fact, together with a long life cycle, seldom less than twelve months, makes the biotic potential of this species low, and indicates that numerous breeding places must have been present before the fires to account for the extent of the infestation of the fire-killed timber. Oviposition occurs over the warmer months of the year. A few eggs are deposited in the winter, but eggs and immature larvae are comparatively rare over this period.

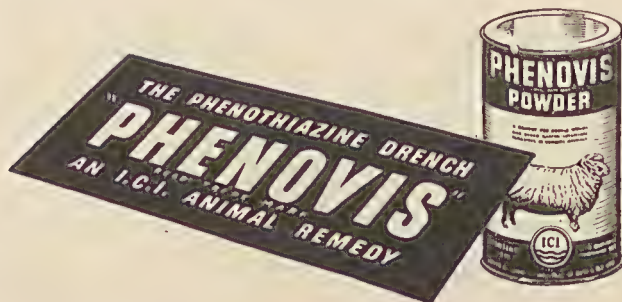
No further excavation takes place by the female after oviposition commences, but the gallery is further extended when the first larvae becomes full-grown.

The frass produced by the larvae is of the "mealy" type similar to *Anobium* or *Lyctus*, while the adult produces a frass consisting of "splinters" of wood, some as long as the diameter of the gallery, and evidently produced by tearing the fibres out after first cutting the outside edge in a circle equal to the diameter of the tunnel (Fig. 6).

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PUPATION

Before pupation the full-grown larvae excavate pupal cells and external evidence of the preparation of these cells is the intermittent production of granular frass instead of continuous activity. The intervals of inactivity probably correspond to the interval between the completion of a cell by one full-grown larvae and the commencement of a new one by the next.

It is seldom that frass production continues after the first emergence takes place, indicating that either the whole brood have excavated pupal cells by this time or that some cells are used again by later-maturing larvae. The maximum number of cells found in any one gallery has been 34 which compares with the maximum number of adults recorded as emerging from one entry.

EMERGENCE

Emergence takes place from the original entrance to the gallery; thus enabling trapping from individual entries (Fig. 8). Only one generation occurs in any one gallery. To make way for an emerging beetle of the new generation, the parent male backs out from the tunnel and returns to the gallery after the beetle has emerged. The period of emergence from any one entry is long, as usually only single individuals emerge at any one time and this may continue over the whole season, or commence towards the end of one season



Fig. 5.—Frass on exterior of Myrtle Beech log.

and be resumed over part of the next. Larvae may still be present in a gallery from which emergence of adults has commenced.

PERIODICITY

Flights occur on any day of the season that suitable temperatures occur; from field observations it was considered that appreciable numbers emerged providing the temperature was over 60°F.

Invariably the males emerge in the late afternoon and the females in the early morning. Seasonal emergence and the numbers emerging appear to be related to temperature and will be discussed under ecology.

The total number emerging from individual entries have not been obtained in the field but under insectary conditions, using sections of small diameter, the average number was 9.8 with a Standard Deviation of 5.1.

The low number accords with the number of immature stages found in small-diameter wood, but the possibility of mite infestation before conclusion of emergence cannot be excluded.

SEX RATIO

In the mass emergence cage the total number emerging for the season 1944-45 was 3,775, of which 1,704 were males and

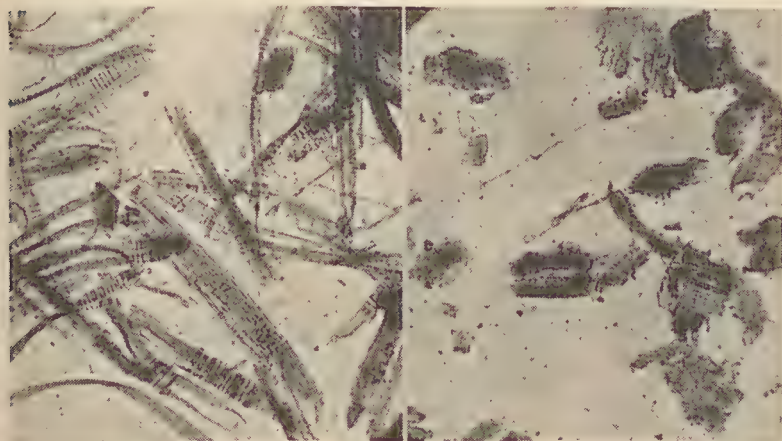


Fig. 6—Left, Frass particles produced by boring of adult beetle.
Right, Frass particles produced by boring of mature larva

2,071 females. A proportion of the males may have been lost since those emerging late in the evening were not always attracted to the window and may have escaped overnight. A more reliable indication is given by insectary figures where, in a total of 670, 337 were males and 333 females from 68 entries. A X^2 value of 0.025 is obtained for a 1 : 1 hypothesis.

LENGTH OF THE LIFE CYCLE

Provided that other conditions are suitable for completion of the life cycle, the rate of development appears to be mainly dependent on temperature. In the forest, a wide range of temperature conditions exists, the chief influences being the amount of shading, position of the tunnel in the log, proximity of the log to soil or water, moisture content of the wood, and the diameter of the log.



Fig. 7.—Mass emergence cage.

The diameter of the log is important because the surface-area/volume ratio is higher in small logs; the mass of the wood also exerts a damping effect on temperature changes, while the centre wood provides a reservoir of moisture which slowly diffuses to the outer wood. Even with these obvious reasons for differences in microclimate, the variation in the length of the life cycle under field conditions is unexpectedly large. The shortest time in which the life cycle has been completed in wood under observation has been about ten months. This took place in wood of comparatively small diameter exposed to

the direct rays of the sun, but prevented from drying out too rapidly by reason of its contact with water. Under sheltered, moist conditions in wood of large diameter in entries marked at the time of the original entry of the beetles two and a half years ago, immature larvae are present, suggesting that the total life cycle will take from four to five years. Under the conditions existing in the Central Highlands at present, it is considered that the average length of the life cycle would be from two to three years.

EXTERNAL EVIDENCE OF LIFE HISTORY STAGES

Certain stages in the life cycle are indicated by the type of frass produced and by the succession of active and inactive intervals. Two types of frass are produced; one consisting of splinters or fibres of wood produced by the adult beetles, and the other of much shorter, almost granular, particles produced by the full-grown larvae (Fig. 6). The stages are as follows:—

Production of loose fibrous type of frass by the male is followed by a period of inactivity until the female commences excavation. Further fibrous frass is produced during the excavation of the gallery by the female and may be of a loose or compacted type according to the extent to which it is allowed to accumulate before being pushed out of the entry. A long period follows during which no frass is produced; and over this period oviposition and larval growth takes place. The larval or "granular" frass is produced when the first larvae reach maturity. The termination of the production of this type of frass is the "pre-emergence" period during which pupation takes place, followed by emergence which may continue over a prolonged period.

THE GALLERY

Most Platypodids construct simple galleries, i.e., unbranched and without pupal cells (Chamberlin, W. J., 1939), but *P. subgranosus* constructs compound galleries, i.e., containing pupal cells. The galleries may be either branched or unbranched, the variation depending on the suitability of the wood for breeding, the more suitable the wood the more complex the gallery. The galleries are always constructed at right angles to the grain of

the wood and, after the initial boring perpendicular to the surface of the wood, tend to curve round in the direction of the annual rings.

It is interesting to observe that, even when the original entry is made from the end of the log, and therefore parallel to the grain of the wood, the female excavates the gallery at right angles to the initial entry made by the male so that the main gallery runs across the grain; in spite of the fact that by doing so the wood is likely to be dried out before the new generation reaches maturity.

In comparison with the galleries of more tropical species of Platypodids, those of *P. subgranosus* are very short. The most extensive would not total more than 12 to 18 inches in length, but 4 to 6 inches are the most common. This is further evidence of the limited reproductive rate of this species, as the small size of the gallery necessarily limits the size of the brood.

The pupal cells are usually constructed mid-way along the tunnel and are usually $1\frac{1}{2}$ inches or more from the external surface of the log.

FOOD MATERIAL

The walls of the galleries constructed by *Platypus subgranosus* become stained black after the beetles have been in occupation for some weeks and cross-sections of these galleries show the presence of a fungus penetrating for a short distance into the surrounding wood tissue. This fungus has been isolated by Mrs. S. Webb, of the Melbourne University, and identified as *Leptographium lundbergia*. Closely associated with this fungus is a yeast which gives the walls of occupied galleries a semi-translucent appearance when freshly opened. After emergence has been completed, the gallery often becomes filled with a white fungus mat, identified as a *Stereum* wood-rotting fungus, and not related to the ambrosia fungus.



Fig. 8.—Technique used in rearing.

Possible food materials are wood sap, fungus, yeast, or the wood itself, and of these the wood sap would be available for only a relatively short period after the tree was felled.

Platypodids, as a group, belong to the ambrosia beetles, i.e., they are generally considered to live upon the fungi which invariably grows within their galleries. In the case of *Platypus subgranosus* the evidence supports this view with the possibility that the yeast present is of equal importance. The evidence against wood being used as a source of food is based on the following observations:—

- (1) In freshly-opened galleries wood particles can occasionally be seen between the wall of the gallery and the abdomen of the female, evidently being passed back beneath the body.
- (2) In making the original entry the male passes the wood particles out beneath the abdomen.
- (3) The frass ejected shows no evidence of maceration as would be the case if passed through the gut of the insect.
- (4) Against the possibility of only portion of the wood being consumed is the fact that the beetles go for prolonged periods, often six months or more, without boring, and subsistence is evidently provided from substances within the gallery over this period.

TRANSMISSION OF THE FUNGUS

The invariable presence of *Leptographium lundbergia* in the galleries formed by *P. subgranosus*, and the fact that this fungus does not occur in wood other than in these galleries, implies the transmission of the fungus from the parent gallery to the new wood by some means; most probably by the beetle.

If carried within the beetle it should be possible to destroy, by means of a fungicide, contaminating spores carried externally, and, provided a fungicide harmless to the insect was used, there would be a possibility of obtaining cultures of the "ambrosia" fungus when the beetles were transferred to an agar slope.

After various trials, cultures of *L. lundbergia* were obtained by the following procedure:—

(1) Immersion of the beetle in a 0.5-per cent. solution of sodium-orthophenolphenate and Agral 1 : 1,000 for a period of two minutes.

(2) Transfer to sterile water and wash for one minute.

(3) Transfer to sterile, dry, sawdust to permit recovery; 3 minutes.

(4) Transfer to malt agar slope.

The whole process is carried out under sterile conditions in an inoculating chamber. Both males and females were treated in this way apparently without ill effect.

Beetles placed on agar slope without this preliminary treatment invariably produced common moulds. Beetles subjected to the above treatment gave cultures of *Leptographium lundbergia* or *Leptographium lundbergia* plus yeast in about 20 per cent. of the tests. In a few instances yeast alone was obtained, but this occurred more commonly when the larvae were tested. The remainder of the slopes were either sterile or contaminated. Longer exposures to the fungicide increased the proportion of sterile cultures while shorter exposures increased the proportion of contaminated cultures. It is concluded, therefore, that the fungus is carried by the beetle, and probably internally.

PARASITES AND PREDATORS

P. subgranosus is remarkably free from attack by natural enemies, and, under field conditions, these were rarely observed. Under insectary conditions, however, two enemies were found in wood brought from an area where the borers were both numerous and had been established over a long period.

Acarina

The mite mentioned previously has been identified by H. Womersley as belonging to the genus *Schiebea* Oudemans of the *Rhizoglyphidae*. This is the first record of this genus in Australia. The species is considered to be near, if not identical, with *S. talpa* Oudemans, known from the burrows of a *Scolytid* in Europe. This mite caused considerable difficulty in rearing *P. subgranosus* and necessitated the precautions described earlier. Attack usually occurs between cessation of the boring of the beetle and of commencement of boring by the mature larva. Death of the borer due to parasitic mites can only be detected by testing the entries at frequent intervals.

Colydiidae

OXYLAEMUS LEAE.—These have been taken in the field and from logs brought to the laboratory for emergence of *Platypodids*. The evidence suggest that these are predators, as they do not bore into wood and enter the galleries of *P. subgranosus* when confined near the entrance. They do not appear to be able to survive in empty galleries of *P. subgranosus*. Colydiids have been recorded previously in India as predators on the *Platypodid* *Diaprus furtivus* S. (C.F.C. Beeson, 1917.)

SUMMARY

An account is given of field and insectary studies of the Pin-hole Borer, *Platypus subgranosus* S. The life cycle and habits of the insect are described, and information given on methods of rearing the borer under artificial conditions, the transmission of the ambrosia fungus, and the identity of several natural enemies of the insect.

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Chamberlin, W. J., 1939; The Bark and Timber Beetles of North America.
Schedl, Karl E., 1936; Recs. South Australian Museum, Vol. V, No. 4, p. 516.

NOTE.—A previous article dealing with survey and field observations made on the pin-hole borers, appeared in the November, 1944, issue of this Journal, pp. 513-524.

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2690	Borthwick, T. and Son	Brooklyn Freezing Works, Braybrook, and Portland Freezing Works, Portland	2587	Harris, L. ..	Lower Main-street, Stawell
2661	Bourke, D. ..	89 Cox-street, Hamilton	2676	Hately, R. N. ..	Manangatang
2559	Brooks, Mrs. E. J. ..	Guthrie-street, Quambatook	2679	Houghton, Wm. and Co. Pty. Ltd.	Macaulay-road, Kensington
2600	Bryant, A. J. W. ..	Hanson-street Corryong	2687	Heddle, R. L. D. M.	4 Wellington-street, Kerang
2653	Bryant, W. D. ..	Buchan, via Bairnsdale	2652	Hicks, J. T. ..	Goroke
2591	Bunn, W. G. ..	South-road, Warragul	2662	Hill, D. and Son ..	6 Phillip-street, Warracknabeal, and at 155 Scott-street, Warracknabeal
2536	Burns and McCleave	206 Mair-street, Ballarat, and Gong Gong-road, Ballarat	2532	Hofbauer, F. ..	35 McIlwraith-street, North Carlton
2594	Burns, W. S. ..	Botany-street, Omeo	2701	Holdsworth, R. M. ..	Boinka
2610	Burrows, G. A. ..	27 Scoresby-street, Kerang	2602	Holdsworth, W. J. ..	Havelock-street, Beaufort
2590	Butler, E. and Sons	Main-street, Tallangatta	2663	Holland, J. W. ..	Cobram
2569	Byerley, H. M. ..	115 Wright-street, Adelaide, S.A.	2618	Irwin F. J. ..	39 Richmond-crescent, East Geelong
2704	Calder Trading Co. Pty. Ltd.	Commercial-street, Korumburra	2544	Jackson, J. Pty. Ltd.	2 Main-street, Bairnsdale
2562	Callan, P. J. and Sons	6-8 Moorabool-street, Geelong	2649	James, D. ..	199 Boundary-road, North Melbourne
2655	Canfield, A. F. ..	Old Tatura-road, Rushworth	2629	Jobe, C. E. ..	Lower Main-street, Stawell
2642	Canfield, E. F. ..	Gillies-street, Rochester	2586	Johnson, A. P. ..	Station-street, Lake Boga
2575	Carllie Bros. ..	Strickland-road, Bendigo	2597	Johnson, P. F. and J. E.	Adelaide-road, Pinnaroo, S.A.
2576	Cary, W. A. ..	High-street, Heathcote	2671	Jones, A. ..	Bombala-street, Delegate, N.S.W.
2609	Claffey, A. S. ..	King-street, Rainbow	2635	Jones, E. V. ..	Harrow
2547	Cohuna Sales and Service	Main-street, Cohuna	2633	Kennon, J. and Sons Pty. Ltd.	River-street, Richmond
2589	Cole, M. ..	Camperdown-road, Terang	2585	Kewin, R. F. ..	Wheeler-street, Corryong
2680	Cook, I. J. ..	Allansford	2708	Kilroy and Story ..	High-street, Heathcote
2603	Cook, T. J. ..	Black-street, Terang	2702	Lindsay, D. H. ..	Charles-street, Jeparit
2685	Cooper, A. S. Pty. Ltd.	87 Lambeth-street, Kensington	2693	Lockwood and Sons Pty. Ltd.	Cunningham-avenue, Birchip
2674	Coulstock, K. ..	65 Welsford-street, Shepparton	2658	Long, C. J. ..	12 Campbell-street, East Kew
2588	Coulstock, T. R. A. ..	Allan-street, Kyabram	2605	Love, J. D. ..	211 Main-street, Bairnsdale
2651	Dallimore, P. J. ..	Allan-street, Noble Park, and at Dandenong and Wonthaggi	2596	McAree, Mrs. M. G. ..	Cr. Warren and High streets, Echuca
2686	Dalton J. ..	Heywood	2711	McClintock, A. E. ..	Bowen-street, Digby
2605	Dewez, T. and Co. Pty. Ltd.	Wool Exchange, Melbourne	2593	McDonald, I. A. ..	Jardine-street, Corryong
2537	Dimboola Stores Ltd.	Lochiel-street, Dimboola	2623	McGauchie, A. A. J.	Main-street, Cobram
2634	Diviny, B. ..	King George-street, Cohuna	2717	McGuire, L. ..	Spencer-street, Albury, N.S.W.
2654	Downes, A. J. ..	Ritchie-street, Dunkeld	2579	McLaren, W. J. ..	24 Baynes-street, Terang
2691	Duggan, T. A. ..	Mollison-street, Kyneton	2541	McLean, A. and Son	Smythe-street, Benalla
2601	Dunn, G. W. ..	Primrose-street, Maryborough	2573	McLennan, D. ..	Webster-street, Wycheproof
2668	Eales, F. ..	Bell-street, Peshurst	2709	McLennan, D. J. and Son	Sea Lake
2564	Easton, Miscamble and Co.	Railway Yards, Williamstown	2622	McMillan, R. H. ..	41 Gibney-street, Maffra
2688	Egan, F. H. ..	High-street, Avoca	2584	Marshall, G. J., and Donnelly	Edenhope
2645	Elias, A. P. ..	Steven-street, Tallangatta	2715	Mitchell, K. R. ..	High-street, Eaglehawk
2666	Elias, E. R. ..	389 David-street, Albury, N.S.W.	2570	Moar, M. A. ..	Cemetery-road, Dimboola
2617	Ellis, J. M. ..	39 Roberts-street, Essendon			
2697	Erwin, V. P. ..	Main-street, Natimuk			
2616	Evans, C. J. ..	83 French-street, Hamilton			
2675	Evans, W. J. ..	Victoria-street, Boort			

LICENSED SKIN BUYERS (continued).

Licence No.	Holder of Licence.	Business Address.	Licence No.	Holder of Licence.	Business Address.
2628	Moore, D. R. ..	Hamilton-street, Killmore	2641	Ross, J. ..	61 Gaffney-street, North Coburg
2560	Morey, H. I. ..	McDonald-street, Numurkah	2713	Ross, J. A. ..	Walwa
2553	Moynihan, J. P. ..	De Boos-street, Euroa	2670	Ruedin, U. F. ..	Whipstick, via Eaglehawk
2538	Mumlay's Distributing Co.	44-48 Moorabool-street, Geelong, and at Colac, Camperdown, and Portland	2577	Russell, R. ..	Colac West
2550	Murphy, D. A. ..	666 Burke-road, Camberwell, and at Station-street, Seymour	2630	S. E. Wool and Skins Ltd.	Sturt-street, Mount Gambier, S.A.
2626	Murphy, T. H. ..	Park-street, Seymour	2582	Sharrock, C. H. J. ..	Bessiebell
2692	Murrell, H. ..	Murray-street, Casterton	2627	Short, I. W. ..	George-street, Hamilton
2599	Murrells and McNicol	Napier-street, St. Arnaud	2574	Sims Cooper (Freezing Works) Pty. Ltd.	Corio Freezing Works, North Geelong; Newport Freezing Works, Newport; Oriental Scouring Mills, North Geelong
2664	New Zealand Trading Co. Pty. Ltd.	514 Flinders-street, Melbourne, and at Maybe-street, Bombala, N.S.W.	2632	Sly, C. ..	Walcup
2620	Nicklen, T. E. ..	Talbot-road, Maryborough	2604	Stanley, J. S. ..	21 Mercer-parade, Newtown, and at Dalgety and Co. Store, Geelong
2648	Niddrie, L. G. ..	27 Lonsdale-street, Hamilton	2572	Stanton, J. ..	Nelson-street, Nhili
2534	North Western Wool and Skin Stores	Gummow-street, Swan Hill	2535	Stevens Bros. ..	160 Firebrace-street, Horsham
2706	Nulty, B. A. ..	Dartmoor	2640	Stevens Bros. ..	Rosebery
2554	O'Beirne, J. and F. ..	Linton	2540	Sutton, Mrs. J. S. ..	Cr. Havelock and Livingstone streets, Beaufort
2621	O'Beirne, J. D. ..	Hamilton-street, Horsham	2567	Taylor, H. G. ..	Cumming-avenue, Birchlip
2636	O'Donnell, J. A. ..	Renmark-avenue, Renmark, S.A.	2631	Teasdale, R. L. ..	High-street, Charlton
2694	O'Neill, P. ..	Princes-highway, Allansford	2712	Thomas, F. ..	Tintalra
2637	Oppenheim, W. ..	21 Peel-street North, Ballarat	2595	Thomas, S. S. ..	Cr. Wattle and Victoria streets, Bendigo
2647	Parker, S. K. ..	Wodonga	2644	Thompson, W. L. ..	Melbourne-road, Yea
2714	Peach, A. C. J. ..	High-street, Macarthur	2683	Thornton, G. J. ..	No. 1 Lower-street, Corowa, N.S.W.
2556	Penney, F. H. ..	3 Balacava-street, Ballarat	2581	Tolson, L. M. ..	Victoria-street, Korumburra, and at Mirboo North
2638	Penney, H. ..	422 Ascot-street, Ballarat	2545	Vines, A. A. ..	Bromley-road, Robinvale
2546	Perkins, C. T. Ltd. ..	Robertson-street, Naracoorte, S.A.	2608	Waters, S. H. and Co. Pty. Ltd.	514 Little Collins-street, Melbourne, and at Hamilton Casterton, Benalla, Wangaratta, Coleraine, Horsham, and Ararat
2583	Permezel, Y. A. ..	High-street, Yackandandah	2672	Westphalen, W. R. ..	Yaapeet, and at Rainbow Brougham Place, Geelong
2624	Perry, A. J. ..	Princes-highway, Colac	2606	Wheatland, W. and Co.	
2551	Pettit, W. B. ..	57 McMahon-street, St. Arnaud	2568	Wheaton, C. M. ..	Miram
2678	Pickthall, J. W. ..	4 Silvermines-road, St. Arnaud	2698	Wheeler, R. H. ..	Sea Lake
2703	Poowong Produce Co.	Nyora	2561	Wilcox Mollin Ltd. ..	Footscray and Dynon roads, Footscray
2549	Prevost and Co. Pty. Ltd.	555 Little Collins-street, Melbourne	2614	Wingfield, Mrs. E. H.	High-street, Charlton
2615	Pyramid Co-operative Society Ltd.	Kelly-street, Pyramid Hill	2716	Woolfe, R. C. ..	63 Middle-road, West Maribyrnong
2571	Reason, C. ..	Pekin-road, Maryborough	2684	Wray, L. N. ..	79-81 Malop-street, Geelong
2542	Rehnsch, H. K. ..	223 Main-street, Ballarat	2578	Wright, N. A. ..	High-street, Shepparton
2695	Reld, A. N. ..	Port Fairy-road, Hamilton	2563	Young, H. ..	Orford
2659	Rice, F. E. ..	Hamilton-road, Macarthur	2710	Young's Blue Store Pty. Ltd.	Cumming-avenue, Birchlip
2673	Rice, J. P. ..	Murtoa	2681	Zed, A. and Sons ..	Commercial-street West, Mount Gambier, S.A.
2639	Rice, J. W. ..	20 Doveton-street, Ballarat			
2656	Rice, W. T. ..	Bombala, N.S.W.			
2539	Rich and Gross	Brougham Place, Geelong			
2646	Richards, E. R. ..	1 North-western-road, St. Arnaud			
2700	Richards, J. J. ..	42 Crimea-street, Caulfield			
2598	Rodda, L. F. ..	Railway Yards, Beulah			
2612	Ross and Brewster Pty. Ltd.	1 Little Curran-street, North Melbourne			



CERTIFIED PULLORUM-TESTED FLOCKS (POULTRY)

A certified Pullorum-Tested Flock is one in which all stock over six months of age have given a negative reaction to the agglutination test for Pullorum Disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector.

The undermentioned flocks have been certified by the Department of Agriculture, and will remain so for the current calendar year, or until such time as the Chief Veterinary Inspector determines.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Particulars of breeds of birds tested are as shown hereunder:—

A. Australorp; B. White Leghorn; C. Rhode Island Red; D. Sussex; E. Langshan; F. Brown Leghorn; G. Buff Orpington; H. Black Leghorn; I. Minorca.

Owner.	Breed.	Number of Birds.	Owner.	Breed.	Number of Birds.
Agricultural College, Dookie ..	A, B	2,120	Grosvenor, E. W., and E. K., "The Haven Poultry Farm," Springvale ..	A, B, C	566
Anderson, G., Greensborough-road, Macleod ..	A	1,409	Guy, C. J., "Murlea," Murgheboluc ..	A, B, C	557
Anguey, H., Hargrave-street, Castlemaine ..	A	775	Gwyther, R. P., Highton ..	B	1,220
Arnold, J. B., Terrara-road, Vermont ..	A	713	Hall, R. H., Wal Wal ..	A, B	857
Ashgrove Stud Poultry Farm, Cockatoo ..	A, B, C	4,427	Hall, W. S., Cairns-road, Lyndhurst ..	A, B, C	1,081
Avonlea Poultry Farm, A. E. Gibbs, Prop., Stanhope ..	D, E		Hamblin, N. A., "Sunny Hill Poultry Farm," Toolleen ..	A, B	2,905
Baker, J. V., Albion-crescent, Greensborough ..	A, B	3,981	Hamilton, W. J., Wood-street, Stawell ..	A, B	945
Bantick, K., Old Dandenong-road, Heather-ton ..	A	699	Hanson, S. H., Box 7, Kilmore ..	A	206
Barnstoc Experimental Farm, P.O., Croydon ..	A, B	2,375	Harrington, W. H., 179 Woodward-street, Golden Square ..	A, B, C	1,764
Barnes, Mrs. A., The Heights Poultry Farm, Blackburn-road, Blackburn ..	A, B, C	3,323	Harrison, Mrs. A., Shenfield-street, Cobden ..	A, B	247
Bartlett, N. M., Pimpino ..	A, B	264	Hayes Bros., Mt. Dandenong-road, Montrose ..	A, B	2,651
Bastin, W., Banbury-road, Reservoir ..	A, B	1,278	Hemphill, A. E., Monegetta ..	A, B	522
Batcy, F. A., Katandra North ..	A	141	Henderson, C. W., "Clifton," Shepparton East ..	A	462
Batey, L. J., Katandra North ..	B	887	Henderson, W. R., 22 Chesterville-road, Cheltenham ..	A, I	228
Batey, R. F., Invergordon South, via Tally-garopna ..	A	1,599	Hewett, A., Central-avenue, Bayswater ..	B, C	1,415
Bayfield, A. E., Westall-road, Spring Vale ..	B, C	1,381	Hewitt's Poultry Farm, Skene-street, Bendigo ..	A, B, C	1,374
Billman, J. H., Skene-street, Bendigo ..	A, B, C	742	Hines, B., Box 80, Donald ..	B	425
Bingley, A., 333 Highbury-road, Burwood ..	A, B	2,062	Hooker, Mrs. E. L., Cr. Heatherton and Westall roads, Springvale ..	A, B, C	957
Bishop, Mrs. P. M., Springvale-road, Spring-vale South ..	A, B, C	1,601	Howard, A. P., Brookville, Kyneton ..	A, B	1,273
Boyce, A. D., Springvale-road, Forest Hill ..	B	2,139	Hunt, R. R., 365 Highbury-road, Burwood ..	A, B	1,197
Bray, J., 18 Hotham-street, Warrnambool ..	B	96	Hurst, Mrs. B. H. G., New-street, Eltham ..	B	1,636
Brumby, W. E., Ellendale-road, Noble Park ..	A, C	402	Inglis, W., Cobham-road, Mitcham ..	A, B	459
Calder, R. A., Langwarrin ..	A, B	1,135	Jackson, Miss E. M., 4 Monash-street, Box Hill ..	B	52
Canning, P. G., Shepparton East ..	B	3,974	Jenkins, A. E., Pen-y-bryn, Kallista ..	C	1,076
Cashin's Poultry Farm, Stawell ..	A, B	3,860	Johnson, A. S., Burwood-road, Lower Fern-tree Gully ..	A, B, C	2,424
Chapman, Mrs. E. E., Youanmite ..	A	253	Kay, V., 12 Wellington-avenue, Blackburn ..	B	2,776
Christie and Son, Tucker-road, Bentleigh ..	A, B, C	1,146	Kemp, H. L., Whitehorse-road, Ringwood ..	A, B, C, D	2,465
Clements, Wm. H., 7 Crown-road, Ivanhoe, N.21 ..	B, C	60	Kerr, J. J., Clarke-road, Springvale ..	A, B	2,319
Coakes, G., Central-avenue, Bayswater ..	B	352	Lang, J., 46 Dundas-street, Thornbury ..	E	124
Collins, A. J., Old Beaconsfield-road, Emerald ..	A, B	473	Lawson, A. J., Box 167, Horsham ..	A, B	416
Colquhoun, W. L., "Arling," Ringwood ..	A, B	146	Lintermans, Messrs. W. A. J. and Son, Major-road, Lysterfield ..	C	879
Cook and McKnight, Croydon North ..	A, B	1,354	Lonie, R. A., 1 Chanak-avenue, East Malvern, S.E.5 ..	B	38
Corbett Bros., Torbay-road, Macleod ..	A	2,458	Longerenong Agricultural College, Dooen ..	B	372
Crowle, L. Z., "Monomeeth," Broadford ..	A, B	900	Lucas, G., 4 Downing-street, Blackburn ..	A, B	1,967
Davey, A. R., Sellars-street, Greensborough ..	A, B	1,271	Magnusson, L., Nathalia ..	B	952
Davidson and O'Keefe, 22 Sherbrook-avenue, Ringwood ..	A, B	144	Maher, Allan E., "Alendale," Wal Wal ..	B	748
Davies, L. F., off Westall-road, Springvale ..	B, C	2,198	Major, C. D., Simpson's-road, Eaglehawk ..	A, B	2,021
Dawson, R., Maldon-road, Castlemaine ..	B	1,586	Marshall, A. R., Archie's Creek ..	A, B, C	936
Day, L., Kyvalley ..	A, B, C	1,717	Mayne, N., Brandy Creek-road, Warragul ..	A, B	77
Dent, A. T., "Ridgeway," Sellars-street, Greensborough ..	A, B	1,178	McCabe, R., Gladstone-road, Dandenong ..	A, B	2,168
Dobson, C. W., Whittlesea ..	C	108	McCann, Messrs. R. and Son, Crowlands-road, Stawell ..	B	3,456
Dyson, F., Post Office, Mooroopna ..	A, B, C	744	McErval, P. A., Kingclare Poultry Farm, Boronia-road, Vermont ..	A, B	2,874
Emmott, J. T., Verdon-street, Inglewood ..	A, B, C	314	McLaren, A. D., Mooroopna ..	A, B, C	369
Everard, H. L., Hawkesdale ..	A, B, C	924	McLauchlan, D. F., Rossiter-road, Koo-wee-rup ..	A, B	2,147
Fellows, J., Yan Yean-road, Plenty ..	A, B, C	521	McNamara, E., Sherbrooke Hatchery, 49 Whitehorse-road, Ringwood ..	A, B, C	546
Ford, J. V., 11 Barkers-avenue, Shepparton ..	A, B, C	997	McNamara, O. J., 24 Sherbrooke-avenue, Ringwood ..	A, B, C	1,716
Fraser, R. A., Colchester-road, Kilsyth ..	A, B, C	1,185	McVay, A., Kernot-street, West Footscray ..	A, B	2,681
Frye, I. H., Grimshaw-road, Watsonia ..	A, B	1,996	Mead, J. L., 28 Golf Links-road, Oakleigh ..	A, B	317
Fullerton, G. H., 57 Just Point, Long Gully, Bendigo ..	A, B, C	344			
Gedye Bros., Railway-road, Blackburn ..	A, B	4,594			
Glarrusso, G., Braeside ..	B	801			
Graham, C., "All Black Poultry Farm," Portarlington ..	A	60			
Grenville, G. W., Springvale-road, Spring-vale ..	A, B, C	3,327			

CERTIFIED PULLORUM-TESTED FLOCKS (POULTRY)—continued.

Owner.	Breed.	Number of Birds.	Owner.	Breed.	Number of Birds.
Meier, C. G., "Bylands," Sydney-road, Killmore	A, D	40	Simmons, J. T., 6 Lindsay-avenue, Murrumbidgee	B	29
Merrett, A. W., Albert-street, Sebastopol ..	A, B, C	239	Simpson, G. D., May-road, Glen Waverley	B	7,106
Milligan, V. R., State School, Ballendella ..	B	35	Smith, A. H., Marong-road, Maiden Gully	A, B, C	1,100
Milner, Messrs. T. and Son, Austin-crescent, Pascoe Vale	A, B, E	2,800	Smith, W. T., and F. W., Panton Hills ..	A, B	1,832
Molson's White Leghorn Stud (H. Durkin, Manager), 188 Surrey-road, Blackburn	B	1,089	Snodgrass, R., Pakenham East ..	B	1,015
Monsant, J., Maiden Gully, via Bendigo ..	A	1,557	Stant, Messrs. W. J., and F. L., Springvale Chick Service, Westall-road, Springvale	A, B, C	3,996
Moore, H. A., Warrandyte-road, Ringwood North	A, B	1,062	State Research Farm, Werribee ..	A, B	903
Morgan, S. G., Glenburnie-road, Mitcham ..	A, B	655	Statham, S. B., 16 Inglewood-road, St. Arnaud	A	688
Moroney, J. B., Kangaroo Flat ..	A, B	1,670	Stewart, J. A., Maldon-road, Castlemaine ..	A, B	520
Mumford, L. J., Healesville ..	A	393	Stewart, P. D., Bayswater-road, Croydon ..	A, B	987
Nemet, P., Springvale-road, Springvale South	A, B, C	2,391	Stiles Bros., "Fairview," Wallan ..	B	871
Niewand, F. J., "Kalang," Lubeck ..	A, B, C	1,556	Streeter, H. A., Avoca ..	B	544
Overman, V. C., Vernal-avenue, Mitcham ..	A, B	1,944	Success Poultry Farm, 13 Knight-street, Shepparton	A, B, C	1,362
Owen, H. T., Chum-road, Healesville ..	B	296	Swift, D. A., Kangaroo Flat ..	A, B	2,468
Paton, W. S., Glenburnie-road, Mitcham ..	A, B	626	Thompson, G., Westell-road, Springvale ..	A, B	1,648
Poulton, A. W., Vickers-street, Sebastopol	A, B	1,875	Voight, A. H., Pollett-road, Cheltenham ..	A, B	1,154
Rae, J., 277 Albert-street, Sebastopol, Ballarat	A, B, C	1,679	Watling, T. F., Bayswater ..	A, B	300
Reher, F. L., Temple-street, Burwood ..	A, B, C	2,219	Wakeham, W. M., 20 Frederick-street, Heidelberg	A, C	50
Robinson, W., 11 Olive-street, Hampton, S.7	C	471	Walton, F. R., Woodvale-road, Boronia ..	A, C	724
Rosebank Poultry Farm, 119 Rathgowan-road, Reservoir. (H. Taylor, proprietor)	A, B, C	3,171	Wandong Poultry Farm, Lawn-road, Noble Park	A, B	1,284
Rossmyne Poultry Farm, Box 38, Avoca	A, B	1,781	Wanliss, W. J., Springvale South ..	A, B	1,882
Salmond, J. B., Deer Park ..	H	230	Watson, W. K., Greenvale-road, Somerton	A, B	860
San Miguel, A. S., Woodhouse-grove, Box Hill	A, B	2,210	Waugh, A. J., Kangaroo Flat ..	A, B	1,202
Scales, J., West Wattle-tree-road, Boronia ..	A	1,382	Welsh, T. A., Bayswater-road, Croydon ..	A, B	4,512
Schulze, Mrs. C. A., Box 52, Dimboola ..	A, B	200	Wernli, J. H., Wilson-street, Cheltenham ..	A, B, D	1,535
Scouler, R. C., Tarrant-street, Cobden ..	A, B	489	Wesley, J. H., Kangaroo Flat ..	A, B, C	1,810
Settle, J. H., Stanhope ..	A, B, C	1,484	Wilkinson, L., McKenzie-road, Golden Square	A, B	369
			Wimhurst, J. C., Private Bag, Tongala ..	B	523
			Winter, G., "Denehurst," Murghebolue ..	A, C	470
			Wohlers, S., Box 17, Jung ..	A	300
			Wright, D. E., South-avenue, Mt. Evelyn ..	C	64

Chick Sexing Examination

An examination in chick sexing will be held at the Veterinary Research Institute, Parkville, commencing on Tuesday, 5th October, 1948.

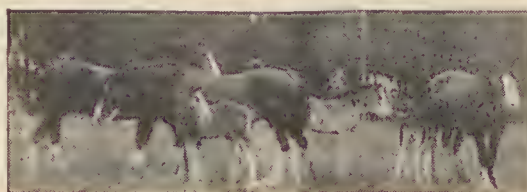
A Special Certificate will be awarded to candidates who are able to sex three hundred chickens in 45 minutes with an accuracy of 98 per cent. and without injuring a chicken.

A First Class Certificate will be issued to candidates who sex 200 chickens in 30 minutes with an accuracy of 95 per cent.

A Second Class Certificate will be issued to candidates who succeed in sexing 200 chickens in 50 minutes with an accuracy of 95 per cent.

Candidates will be required to bear the cost of the chickens at £2 17s. 6d. per hundred.

Applications close on Saturday, 4th September, and should be addressed to the Chief Veterinary Inspector, Live Stock Division, Department of Agriculture, Melbourne, C.2, accompanied by an entrance fee of 10s. 6d.



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STANDARD HERD TEST

Report for Year 1947-48

By C. J. Bradbury, B.Agr.Sc.



Mr. G. F. Charlton's Jersey herd which won the Reserve Championship in this year's test with an average yield of 572.5 lb. butterfat.

OWING to the greater appreciation by breeders of the benefits accruing from herd testing, the Department this year has been inundated with applications from breeders seeking entry to the Standard Herd Test. Testing facilities at the State Laboratory, however, were insufficient to allow a general acceptance of all applicants, but the position was somewhat alleviated by the introduction of the composite system of sampling in place of the double-sample system previously in use. This system, while halving the laboratory work, yet produced results practically identical with those derived from the double-sample system. This was evidenced by an investigation on the two sampling methods carried out by the Department, the results of which are set out in the table on page 422.

The adoption of the composite sampling method enabled the Department to accept, during the past twelve months, some 60

to 70 new herds, comprising 1,000 cows, bringing the total of tested cows to 4,975 for the year, an increase of 1,047 on last year's aggregate of 3,928 cows.

During the year, upwards of 6,500 cow records were handled by the herd testing staff. Many of these cows had not completed their 273-day test by the 30th June, and, therefore, do not appear in this report, while some 992 cows had incomplete records due to exemptions, withdrawals, and other causes.

AVERAGE YIELD OF ALL TESTED COWS

The average yield of 343 lb. butterfat for all tested cows was only 17 lb. lower than the record of 360 lb., made in the good dairying season of 1939. In view of the fact that a poor autumn had been experienced in some areas, especially in



Surrey Starette 10th, leading cow in Mr. J. Stedman's Champion herd.
This mature Jersey produced 715 lb. butterfat.

Gippsland, and that approximately half of the herds included in this average had little or no previous herd testing background, this yield was particularly gratifying. Of the 4,975 completed cow records handled during the year, no fewer than 310 cows exceeded the high level of 500 lb. butterfat. Fifty-one of these produced over 600 lb. butterfat and nine produced over 700 lb. Highest yield of the year, 821.4 lb. butterfat, was made by Captain A. E. T. Payne's mature Guernsey, Yarraview Le Mode, but, as this cow did not re-calve within the stipulated period, she was ineligible for the championship.

THE CHAMPION HERD

This year's Herd Championship goes to the "Surrey" Jersey Stud, owned by Mr. J. Stedman, Appin, northern Victoria. In its first two years in the test, this herd has gained the Reserve Championship and the Championship, truly a remarkable performance.

The two sires, Brucevale Lord Fancy and Orphanage Attraction's Knight, were used extensively in building up this herd. Through their own breeding they have introduced into the "Surrey" stud some of the best blood of other notable herds under the Standard Test.

With 36 cows, an increase of 6 on last year's total, Mr. Stedman's herd has registered the excellent average of 512 lb.

butterfat (actual) which is raised to 585.5 lb. when allowances are made for junior animals. The uniformly high standard of this herd is shown by the fact that the 36 cows averaged 512 lb. butterfat and yet only two yielded over 600 lb.

The eight mature cows in "Surrey" herd have an average of 562.1 lb. butterfat. They include Surrey Bonnie Madeira 11th with 642.7 lb. and Surrey Starette 10th with the high yield of 715 lb. butterfat.

With an average of 503.8 lb., the eight junior four-year-olds in this herd include Surrey Boronia

27th, which obtained fourth placing in the junior four-year-old class with a yield of 592 lb. butterfat.

Surrey Starette 15th was placed second in the senior two-year-old class with 560.7 lb. butterfat, while the eight junior two-year-olds in this herd returned an actual average of 455.7 lb. Of these, Surrey Lady Doreen 24th, with a yield of 558.3 lb. butterfat, and Surrey Boronia 31st, with 539.2 lb., were placed second and third respectively in the junior two-year-old class.

With such an outstanding array of junior cows, the "Surrey" herd gives promise of retaining a leading position in the Standard Herd Test.

THE RESERVE CHAMPION HERD

The Reserve Herd Championship this year goes to the "Windarra" Jersey Stud, owned by Mr. G. F. Charlton, of Stony Creek, South Gippsland.

This herd is also relatively new to the Standard Herd Test, but has an outstanding Herd Test background, as it was founded on the well-known "Lumeah" stock—the "Lumeah" Stud was owned by the late J. C. Charlton, father of the owner of the Reserve Champion Herd.

In the three years it has been under test, "Windarra" herd has performed with distinction, and this year attained the high

average of 501.5 lb. actual butterfat, or 572.5 lb. for the 23 cows when allowances were made for junior animals.

"Windarra" herd, this year, had a high uniform production which included four cows yielding over 600 lb. butterfat.

Lumeah Marie, with a mature record of 667.7 lb. butterfat, is the highest-producing cow in the herd, and one of the five mature cows which averaged 505.7 lb.

The yield of 612.1 lb. butterfat placed Lumeah Sister fourth in the junior three-year-old class, while the junior four-year-old Lumeah Magnify, with 644.2 lb. butterfat, and the senior two-year-old Lumeah Soprano, with 607.1 lb. butterfat, were top of their age classes.

OTHER HIGH PRODUCING HERDS

With an average yield of 469.9 lb. actual butterfat and 565.1 lb. with allowances, the 35 "Mornmoot" Jersey cows, owned by Mr. N. H. Young, Whittlesea, gained third place. The highlight of this herd was the performance of four junior two-year-olds, each of which produced over 500 lb. butterfat. This is an outstanding performance and eclipses the record set by Dr. A. R. Haywood, who had three junior two-year-olds over 500 lb. butterfat in his Champion Herd of 1946-47. Three

of these junior two-year-olds, namely, Mornmoot Northwood Madeira 22nd (518.8 lb. butterfat), Mornmoot Mimi 11th (515.3 lb.), Mornmoot Princess Madeira 41st (514.6 lb.), are listed 4th, 5th, and 6th respectively in the junior two-year-old class; while Mornmoot Mimi 10th produced 509.7 lb. butterfat.

Mornmoot Princess Madeira 37th, with 592.3 lb., is listed 5th in the junior three-year-old class.

With an actual average of 454.5 lb., and an average of 536.0 lb. butterfat with allowances, the 46 "Verbank" Jerseys, owned by Mr. P. W. Lineham, include three cows with records over 600 lb. and four cows in the "age class" list.

Captain A. E. T. Payne's "Yarraview" Guernsey herd of 31 cows, with an average of 485 lb. butterfat (raised to 534.5 lb. with allowances), is again characterised with high-producing mature cows. This herd includes no less than nine cows with yields in excess of 600 lb. Among these are Yarraview Le Mode with 821.4 lb., and the Champion Cow, Yarraview Carol, with 768.9 lb. butterfat. Yarraview Golden Daffodil is conspicuous among "Yarraview" juniors with an outstanding junior three-year-old figure of 728 lb.

The "Windrest" Jersey Stud, last year's champion herd, is again among the leaders. This year the 55 cows in Dr. A. R. Haywood's herd averaged 446.6 lb. butterfat,



Four outstanding junior two-year-olds from Mr. N. H. Young's "Mornmoot" Jersey Stud, Whittlesea. Left to right: Mornmoot Mimi 11th (515 lb. butterfat); Mimi 10th (510 lb.); Northwood Madeira 22nd. (519 lb.); and Princess Madeira 41st (515 lb.)



Yarraview Le Mode, Captain A. E. T. Payne's mature Guernsey, was the highest producing cow of the year, with a yield of 821.4 lb. butterfat, but was ineligible for the championship (see text).

and, with allowances for 37 junior animals, averaged 526.2 lb. Five "Windrest" cows exceeded 600 lb. butterfat, and three gained admittance to their respective class lists.

Of 43 herds which averaged over 400 lb. actual butterfat, thirteen attained the high average of over 500 lb. when all allowances were added. Prominent among these are the twenty Friesians owned by the Department of Agriculture (522.9 lb. butterfat) and the twenty Jerseys owned by Messrs. S. H. Masters and Son (510.3 lb.).

Three Jersey herds owned by Mr. J. H. Phillips, Mr. A. E. Dowel, and the Estate of the late W. H. Hurrey, are to the fore in the 15 to 24 cow section with herd averages, with allowances, exceeding 500 lb. butterfat.

Mr. P. J. Maloney's 33 "Belgonia" Jerseys returned an average of 500.7 lb. butterfat, while Messrs. O. Ronalds and Son lead the small-herd section with a net yield of 469.5 butterfat, and a gross average of 504.1 when allowances are made for the six juniors in this herd of eleven cows.

A herd of thirteen Guernseys obtained second place in the small-herd section for Mr. C. W.

Scott, with an actual average of 482 lb. butterfat.

The Friesian breed was well represented by Mr. G. Polmear's 32 cows, with an average, with allowances, of 489.9 lb. butterfat.

Good performances were also made by the herds of Messrs. J. W. Bennett, Fairchild and Clutterbuck, J. A. Till, L. Williams, W. A. Broad, G. Beggs, H. D. L. Thompson, and A. L. Scott.

The 71 Red Polls belonging to the Department of Agriculture returned the excellent average, for a large herd, of 348 lb. actual butterfat.

A full report of each herd, and particulars of the various age groups, are given at the end of this report.

THE CHAMPION COW

The champion cow this year, Yarraview Carol, had a mature production record of 12,674 lb. of milk testing 6.07 per cent. butterfat, and a total butterfat record of 768.9 lb. Carol, by producing 36 lb. of milk on the last day of test, showed that she is not only a prolific producer, but also possesses a high degree of persistency of



Another high producer, the Department of Agriculture's mature Friesian, Victoria Belle (774.6 lb. butterfat). This cow was also ineligible for championship honors.

production. She is by the noted "Yarraview" sire, Honorias Benefactor (imp.), which has sired many high-producing cows.

Carol, which has aggregated 2,974 lb. butterfat in six lactations, crowned her past performances by producing 768·9 lb. butterfat this year.



The Champion Cow, Yarraview Carol, a member of Captain A. E. T. Payne's Guernsey herd. Carol yielded 769 lb. butterfat.

Yarraview Le Mode, Carol's herd mate, with a mature yield of 821·4 lb. butterfat, has the highest production for the year, but as she did not re-calve within the time period specified, was ineligible for the championship. This cow was denied the championship for a similar reason in 1944-45. In that year she followed her record yield of 975 lb. butterfat with 963 lb. butterfat.

The Friesian cow, Victoria Belle, owned by the Department of Agriculture, was next in production with 774·6 butterfat, but she also failed to re-calve in the stipulated time.

RESERVE CHAMPION COW

The Reserve Championship award goes to the fifth highest-producing cow, a Jersey senior three-year-old, Elm Grove Songstress 5th, owned by Mr. W. C. R. Gay. This cow has followed her senior two-year-old

figure of 475·6 lb. butterfat with a total of 747·8 lb. this year. Her 11,165 lb. milk tested 6·70 per cent. fat. This junior Jersey not only gains the Reserve Championship but also attains the honour of being the highest-producing Jersey for the year.

Mr. J. H. Goddard's senior three-year-old Ayrshire, Olive Dale Dove, was debarred from the championship, as she, too, will not re-calve within the stipulated time. Her year's production was 763·1 lb. butterfat.

OTHER HIGH-PRODUCING COWS

Yarraview Siren, former Champion and Reserve Champion cow in the Standard Herd Test, is one of the really outstanding test cows in Victoria. This year's yield of 731·2 lb. butterfat brings the Guernsey's lifetime aggregate to 6,170 lb. butterfat. Yarraview Ruby, Chamois, De Luxe, Heritage, and Teeny, each with yields exceeding 600 lb. butterfat, are five other outstanding mature "Yarraview" Guernseys owned by Captain A. E. T. Payne.



Elm Grove Songstress 5th, the Reserve Champion Cow. This senior three-year-old Jersey owned by Mr. W. C. R. Gay, produced 748 lb. butterfat.

Victoria Olga, with a yield of 705·3 lb. butterfat, and Victoria Jostle

The Six Leading Herds in this year's Standard Herd Test

Stud.	Owner.	Number of Cows Entered.	Average Butterfat Without Allowances.	Average Butterfat With Allowances.
			lb.	lb.
Surrey (Jersey)	Stedman, J.	36	512.2	585.5
Windarra (Jersey)	Charlton, G. F.	23	501.5	572.5
Mornmoot (Jersey)	Young, N. H.	35	469.9	565.1
Verbank (Jersey)	Lineham, P. W.	46	454.5	536.0
Yarraview (Guernsey)	Payne, A. E. T.	31	485.2	534.5
Windrest (Jersey)	Haywood, Dr. A. R.	55	446.6	526.2

and Victoria Josling, each with a yield exceeding 600 lb. butterfat, are a select trio of Friesians belonging to the Department of Agriculture.

Mr. C. W. Scott has three outstanding mature Guernseys in Glenoak Popular Melody, 684.1 lb. butterfat; Bangalow Vale Carmine, 641.3 lb.; and Glenoak Lotty, 631.2 lb.

Willow Park Duchess 35th, the property of the Estate of the late W. K. Atkinson, is the leader of the Dairy Shorthorn breed, with a mature record of 675.5 lb. butterfat.

Dr. A. R. Haywood's three mature Jerseys, Windrest Chevy's Beauty, Windrest Island Star 2nd, and Windrest Rose Bay's Dainty, each exceeded 600 lb. butterfat.

Victoria Electricity, Reserve Champion cow last year, again leads the Red Poll breed, with a yield of 576.7 lb. butterfat, while Douglas Vale Kassie (580.9 lb.), owned by Messrs. G. Tandberg and Sons, leads the Australian Illawarra Shorthorns. This junior three-year-old record is the highest Australian Illawarra Shorthorn production figure ever recorded in the Standard Herd Test.

Many other high production records are referred to in the "age-class" lists, and others are shown in the list of cows producing over 600 lb. butterfat given at the conclusion of this report.

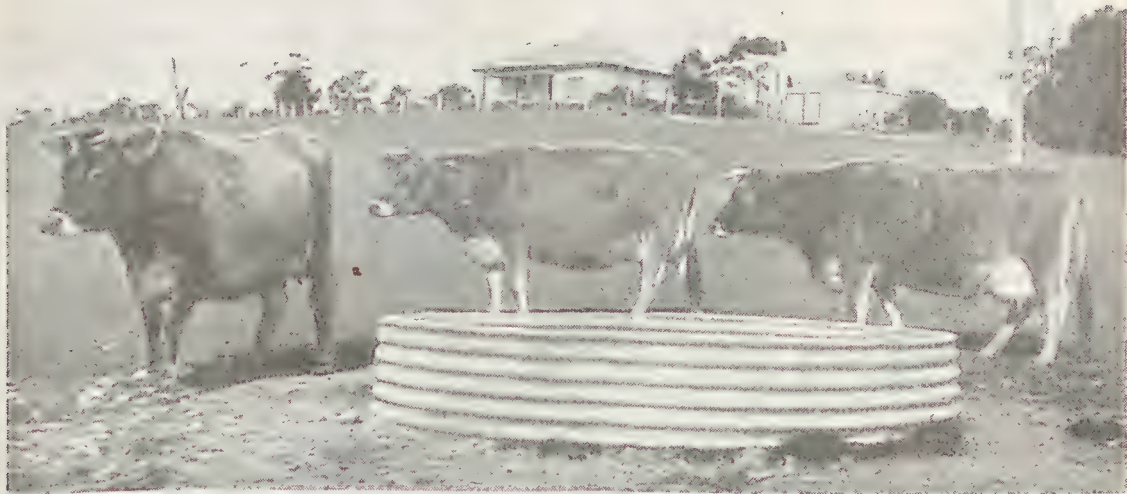
SENIOR FOUR-YEAR-OLD CLASS

In the year under review, 298 senior four-year-olds completed their lactations and returned the high actual average of 376 lb. butterfat. Among their number are 36 cows with yields over 500 lb., and three with yields over 600 lb.

Jerseys occupied the first five positions in this class and were led by Bamawm Lassie Belle 2nd, owned by Mr. L. Williams of Bamawm Extension, with a yield of 652.5 lb.



The leading senior four-year-old, Mr. L. Williams's Jersey Bamawm Lassie Belle 2nd. Belle yielded 653 lb. fat in the 273-day test period.



Three members of Mr. G. F. Charlton's Reserve Champion Herd. Left to right: Lumeah Soprano, leading senior two-year-old (607 lb. butterfat); Olinda (476lb.) and Mervue Kathleen's Pearl, senior four-year-old (551 lb.)

butterfat; while, with 623·8 lb., Lynbrae Waterlily 3rd obtained second place for Mr. R. A. Peck, of Catani.

Another senior four-year-old producing over 600 lb. butterfat is Jindivick Babs 2nd, owned by Messrs. O. Ronalds and Son. Lumeah Veronica May, owned by Mr. H. L. Withal, and Lauriston Satisfaction 2nd, owned by Messrs. Gardener Bros., gained fourth and fifth place with 597·8 lb. and 595·7 lb. butterfat, respectively.

The Friesian breed gained sixth place with 595·3 lb. butterfat produced by Mr. G. Polmear's Fairview Alton Segis.

JUNIOR FOUR-YEAR-OLD CLASS

Lumeah Magnify, a member of the Reserve Champion herd owned by Mr. G. F. Charlton, is the leader of the junior four-year-old class, comprising 369 animals, with an average of 365 lb. butterfat. This cow's yield of 644·2 lb. butterfat, following her two previous high junior records, stamps her as a potential champion, and assures her of a place in the Advanced Register.

Dr. A. R. Haywood's, Windrest Chevy's Bell, is the second of the six Jerseys which take the honours in this class. Her record of 641·6 lb. butterfat, following her two previous junior records of 412 and 507 lb. is a further indication of the quality of her sire, Gadget (imp.).

606·7 lb. butterfat gained third place for Mr. A. E. Dowel's, Wattle Vale Treasure Girl, while Mr. J. Stedman's Surrey Boronia 27th, Mr. P. W. Lineham's Verbank Marie's Empress, and Messrs. F. E. and H. H. Ware's Wolrah Tangerine 2nd, with records of 592·0, 585·5, and 582·3 lb. butterfat respectively, are the top three of the 32 cows in this class which produced between 500 and 600 lb. butterfat.

SENIOR THREE-YEAR-OLD CLASS

With a class average of 357 lb. butterfat, the 387 senior three-year-olds include 30 cows which produced over 500 lb. Of these, four exceeded 600 lb. butterfat and two over 700 lb.

Mr. J. H. Goddard's Ayrshire, Olive Dale Dove, leads this class with 763·1 lb. butterfat, and is closely followed by the Reserve Champion cow, Elm Grove Songstress 5th, with 747·8 lb.

Devon Park Victorious Madeira 2nd, owned by the Devon Park Stud Farm, occupies third position with 646·8 lb. butterfat.

Mr. P. W. Lineham is represented in this class by Elm Grove Linda 16th, with 631·2 lb. fat, while Messrs. R. H. Bennett and Sons and the Estate of the late W. H. Axford gain fifth and sixth place with

Edenhope Gilder Rose 2nd, 592·0 lb. butterfat, and Leura Annette 21st, with 583·0 lb.

JUNIOR THREE-YEAR-OLD CLASS

The junior three-year-old class, totalling 491 cows, includes 29 animals which produced over 500 lb. butterfat. Of this number four exceeded 600 lb. and one 700 lb. With an actual class average of 341 lb., raised to 421 lb. with allowances, the junior three-year-olds have this year returned the highest class-average with allowances.

Leading the class is Captain A. E. T. Payne's, Yarraview Golden Daffodil, with the exceptionally good record of 728·1 lb. butterfat. This yield is the highest ever recorded by a Guernsey junior three-year-old under test in this State.

Jerseys take the next five places in this class, and are led by Mr. P. W. Lineham's, Elm Grove Songstress 6th, with 662·2 lb. butterfat.

Dr. A. R. Haywood is represented by Windrest Noble's Charm 2nd, one of many good daughters sired by Glen Iris Rosebay's Noble. This cow's yield of 621·9 lb. butterfat, following her junior two-year-old figure of 502 lb., indicates her worth.

Lumeah Sister, with 612·1 lb. butterfat, gained fourth place in this class for Mr. G. F. Charlton, while Mr. N. H. Young is represented by Mornmoot Princess Madeira 37th with 592·3 lb. butterfat.

Sixth place is occupied by Dr. Haywood's Windrest Rosemary with a yield of 585·4 lb. butterfat.

SENIOR TWO-YEAR-OLD CLASS

With a class average of 318 lb. butterfat, the 511 senior two-year-olds include eleven cows with yields in excess of 500 lb. butterfat and one, Lumeah Soprano, 607·1 lb. butterfat. This member of Mr. G. F. Charlton's Reserve Champion herd leads the class, and is followed by a member of Mr. J. Stedman's Champion Herd, Surrey Starette 15th, with 560·7 lb. butterfat.

Verbank Daphne, with 559·3 lb. fat, gained for Mr. P. W. Lineham, yet another place in the class lists.

The Ayrshire breed is represented by Mr. J. H. Goddard's Inverurie Flirt, with a yield of 557·3 lb. butterfat.

Windrest Chevy's Chic and Coodardy Lady Twylsh gain fifth and sixth positions for their respective owners, Dr. A. R. Haywood and Messrs. P. W. Clarke and Son, with yields of 533·7 lb. fat and 527·6 lb. butterfat.

THE JUNIOR TWO-YEAR-OLD CLASS

The junior two-year-old class of 1,268 heifers averaged 295 lb. butterfat, and contained some ten cows with yields of over 500 lb.

To obtain the top six cows in this class, it has been the practice in other years to search for junior two-year-old records in the high 400 lb. butterfat zone, but with ten yielding over 500 lb. this year, the selection was simplified.

The six leaders are Jerseys, and are headed by Melksham Daisy 51st, owned by Mrs. W. Carson. This heifer, with the outstanding production of 566·8 lb. butterfat, has established a record for junior two-year-old production in the Standard Herd Test. She eclipsed the previous best Jersey figure of 557 lb. established in 1932-33 by Mrs. M. V. Stephens' Fourshells Air Maid, and also surpassed the best figure, 563 lb., of all breeds established by that great cow, Yarraview Le Mode, in 1938-39.

Surrey Lady Doreen 24th, owned by Mr. J. Stedman, gained second place with the excellent yield of 558·3 lb. butterfat, and was followed by her herd mate, Surrey Boronia 31st, with 539·2 lb. butterfat.

The top three of Mr. N. H. Young's brilliant quartette fill the fourth, fifth, and sixth positions. They are Mornmoot Northwood Madeira 22nd, 518·8 lb. butterfat; Mornmoot Mimi 11th, 515·3 lb.; and Mornmoot Princess Madeira 41st, with 514·6 lb.

(continued on page 422.)



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LIVE STOCK NOTES



Compiled by
A. C. T. HEWITT, M.Agr.Sc.
Live Stock Science Officer

STUD PIG BREEDING

STUD pig breeders should aim at supplying pigs capable of producing large, heavy litters once every six months; litters which will grow quickly and economically to bacon or porker weights. The carcasses should provide a product acceptable to consumers, and to produce such pigs, stud breeders should do all in their power to improve their stock.

Pigs in a stud herd should not be pampered, but given conditions similar to those which a good commercial pig raiser might be expected to provide. All litters should be weighed at definite times, say at birth, the 28th day after birth, and at weaning. If records are not kept for each litter, a stud breeder cannot accurately know the worth of his brood sows. To test for other important characteristics, the stud raiser should weigh his growing pigs at regular intervals, and, if self-feeders are used, he can arrive at an accurate assessment of the quantity of food consumed for the gains recorded.

The English appraisal system is the method by which every pig farmer may use to test the quality of his pigs on the hooks. The Victorian Department of Agriculture has a plan for appraising pigs at factories. A stud raiser should be able to make great use of this plan to improve his stock, particularly in valuing new breeding stock.

A new boar should not be used widely in a herd until it is reasonably certain he has the power to transmit the valuable commercial points mentioned previously. He should be mated with a number of tested sows and the progeny should be tested for growth rate and a proportion in each litter should be appraised. New sows should be mated to tested boars and their progeny tested in a similar manner.

In all cases where the progeny do not measure up to standard, the offending boar or sow should be culled. The exchange or sale of "proven" or tested boars for which there is no further use in one herd has much to commend it from a breeding point of view.

At the next Australian Meat Board Pig Carcass Competition, it is hoped that the number of entries will exceed anything previously attained. At present this is the only carcass competition in which both stud and commercial pig raisers can compete.

In a recent pork and bacon competition, held in the North Island of New Zealand, nearly 1,000 people attended. A grand total of 4,496 carcasses was entered in various district competitions, and 2,676 of the carcasses were sent to the final display in Auckland. These carcasses were from 1,124 exhibits, which compares more than favourably with the 60 exhibits at the Australian Meat Board's Victorian Bacon Pig Competition last May.

[A. D. NORTH, B.Agr.Sc., Science Field.
Officer.]

PIG INDUSTRY SURVEY

The Australian Meat Board recently arranged with the Victorian Department of Agriculture for its pig expert, Mr. L. A. Downey, to conduct a survey of the Australian pig industry.

Mr. Downey will investigate the industry in each State with special reference to districts; its extent and structure; the available and potential supplies of pig food, breeding stock, and methods of pig husbandry; the marketing of pigs and the quality of products; factors limiting production of pigs, and measures for improving the welfare of the industry in general.

In conducting the survey, Mr. Downey will seek the co-operation of State Departments of Agriculture, pig industry organizations, individual pig raisers, and pig-meat traders and their associations.

At the conclusion of the survey, Mr. Downey will prepare a report on his observations and make recommendations for any improvements he considers necessary to benefit the industry.

DAIRY RESEARCH IN U.S.A.

Extensive research ranging from breeding superior cattle to improving the quality of milk produced is being carried on in the United States by the U.S. Department of Agriculture's Bureau of Dairy Industry. The overall objective of the years of research, and the expanded plans for the future, is to enable the farmer to produce, and the consumer to receive, more and better milk at lower cost.

Experimentation in breeding superior dairy cattle has centered on two basic systems—proved-sire and cross-breeding. The proved-sire system of breeding, the Department reports, has now been tried for 30 years at the U. S. Government's agricultural research centre in Beltsville, Maryland, in which 70 cows and 22 bulls—"proved sires"—were used. The cows were about equally divided between the Holstein and the Jersey herds, while two-thirds of the bulls were used in the Jersey herd. No outside cows have been added since the beginning of the experiment, the additions to the stock having come entirely from within the family.

In both herds, the average butterfat production per cow is now more than 200 lb. higher than it was in the foundation

(original) herds, an increase of about 30 per cent. In the last six years, eight Holstein cows have each produced more than 1,000 lb. of butterfat when milked three times a day for 365 days. Only about 70 cows in all Holstein history in the United States have done as well.

In the Jersey herd, 74 per cent. of the last-generation females have produced over 700 lb. of butterfat, and the other 26 per cent. have produced more than 500 lb. At the start of the experiment, only 13 per cent. of the cows produced as much as 700 lb.

The cross-breeding experiment in improving dairy cattle has been stimulated by the successful results in the United States of similar experiments with beef cattle, hybrid corn, swine, and poultry. The success in producing greater milk and butterfat yields through cross-breeding cannot be stated definitely, since this experiment only began nine years ago at Beltsville, but results to date are encouraging.

The major plan in this system calls for the use of proved sires mated to production-tested cows of four different breeds—Holsteins, Jerseys, Guernseys, and Red Danes. Females born from mating two breeds are mated to a proven sire of a third breed, and the resulting three-breed females are mated to a proved sire of still another breed. All cows are milked three times a day for 365 days, and bred four and a half months after calving.

Production records now available for 50 crossbred (two-breed) cows indicate that, at the average age of two years and two months, they yielded 12,958 lb. of milk and 586 lb. of butterfat, an average increase over their straight-bred dams (parents) of 2,668 lb. of milk and 141 lb. of butterfat per cow.

Records for 27 three-breed cows averaged 13,130 lb. of milk and 618 lb. of butterfat at two years and two months old, an average increase over their two-breed dams of 14 lb. of butterfat and an increase of 35 lb. of milk per cow; 17 of the 27 three-breed cows were better than their respective dams in both milk and butterfat output. No four-breed plan has yet been tried.

Considering both of the foregoing methods, the cows at Beltsville have produced five to six times as much milk as the average

cow in the United States, showing the possibilities for improving the yield of dairy cattle.

In addition to the breeding work at Beltsville, the Bureau of Dairy Industry is developing herds at six field experiment stations by the proved-sire system of breeding. Young bulls bred in these herds are loaned to nearby farmers for proving, and also improving the production of their herds. The Bureau also is co-operating with artificial-breeding organizations to improve dairy herds.

Recently, under the *Research and Marketing Act of 1946*, further efforts were started to develop cattle breeding on a broader scale. Breeding centres are being established in a number of dairy States, in co-operation with State colleges and experiment stations.

Another Bureau activity is in co-operation with dairy-herd improvement associations by gathering together the production records of nearly 1,000,000 cows and their progeny every year, analysing and summarising them and returning the information to 30,000 herd owners. This co-operation results in proving several thousand bulls in association herds annually and in providing the dairy industry with basic information for breeding better cattle.

[Extracts from U.S. Department of State Bulletin, May, 1948.]

TABLE POULTRY

The production of table poultry has increased in recent years, and the once despised White Leghorn cockerel has now attained considerable commercial value.

Crossbreeds and heavy breeds have also increased in value, and a number of well-organized plants have been established which specialize in the rearing of table poultry only.

The battery system of rearing and topping off is very popular, and appears to be the most efficient and profitable method for this class of trade. Apart from feeding, the greatest problem seems to be ventilation. The housing of hundreds of birds in closely-packed battery brooders inside rooms presents a problem. The prime factor for normal growth and development is good health, and, where birds are forced to live in badly-ventilated quarters, their health may be impaired and growth retarded.

Many batteries are housed in buildings which were originally constructed for other purposes, and, although some are reasonably satisfactory, others are quite unsuitable. Owners and attendants become accustomed to the condition of the air in the rooms and do not realize its harmful effects.

The efficiency of utilization of feed in relation to the growth of birds is important. Kept under hygienic conditions and well fed, cockerels should weigh 3 lb. at twelve weeks.

Various kinds of foodstuffs are used, but, in all of them, it appears to be necessary for normal growth to keep the meatmeal content at 10 per cent. Vitamins A and D must be supplied by feeding greenstuff and vitaminized oils. The rations are actually growing mash, but are often referred to as fattening mash. Birds do not usually fatten until they have reached maturity, and the purpose of feeding young cockerels is to produce partly-grown birds with plump, well-fleshed breasts.

Pellets have given excellent results and are popular with farmers who prefer not to mix their own mash. Food consumption is higher, but usually is compensated for by the added growth, particularly during the first eight weeks. Pellet-fed birds drink greater quantities of water than those fed wet or dry mash. The droppings are frequently moist, causing the air to become highly contaminated. Birds are usually disposed of when approximately three to four months old, when they should weigh $2\frac{1}{2}$ to 4 lb. each.

[M. D. HALL, Poultry Expert.]

BEEKEEPING

In localities where queens are now laying to expand their brood-nests, it is advisable to see that the colonies have abundant stores in reserve. It is essential that at least 12 lb. of stores are available for brood expansion.

If the brood nest appears to be over-supplied with stores, it is advisable to drop an empty worker comb beside the nest, and scrape some of the honey on other combs ringed around the brood. This causes the bees to remove it, and make some room for the queen to start off.

If the supers contain full combs of stores the removal of a portion of the stores, and

replacement directly above the brood nest with good worker combs, will be found to be beneficial.

Queens slow to expand should be watched, and, if doubt exists as to their future usefulness, they should be replaced. Apiaries should be thoroughly overhauled, and conditions in every colony recorded. Colonies containing worn-out queens should be requeened immediately, as any assistance given them before queen replacement is a waste of time, brood, and bees.

Colonies above normal strength can be relocated with nuclei, and their strength cut down for the time being by the loss of many of the field bees. When changing locations with the nuclei, it is advisable to cage the queens in the nuclei if any doubt exists as to their safety. If the bees fight when changing locations, smoke them vigorously. It is advisable to give extra hive room to the nuclei to cope with the extra bees.

Great care must be exercised to see that no disease is present in the apiaries when comb exchange and relocation are carried out, and it is advisable to have on hand good sets of worker combs during colony expansion.

New colonies can be made up by drawing two combs of brood and adhering bees from each strong colony until there are six to eight frames in the new hives. If these new hives are moved beyond flying distance of the apiary, each given a ripe queen cell and an extra super of combs, apiary expansion is easily attained. Watch closely to see that the mixed bees do not fight. Smoke copiously if they do, and also spray with a little broken down syrup.

Any mice-damaged combs or combs containing drone brood can be repaired by inserting a piece of foundation comb, after removal of the inferior piece.

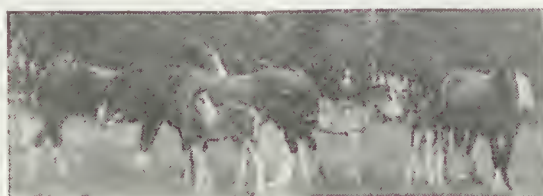
[W. A. COLLINS, Apiary Inspector.]

STUD STOCK IMPORTATIONS

A steady stream of live stock was imported into Victoria from overseas during 1947-48. As usual some of the animals imported into Victoria were for breeders in other States. The import of Romney Marsh sheep has continued at a high rate. In addition to one Jersey bull imported from the United States and one Polled Hereford bull from Canada, the importations from the United Kingdom and New Zealand are shown hereunder.

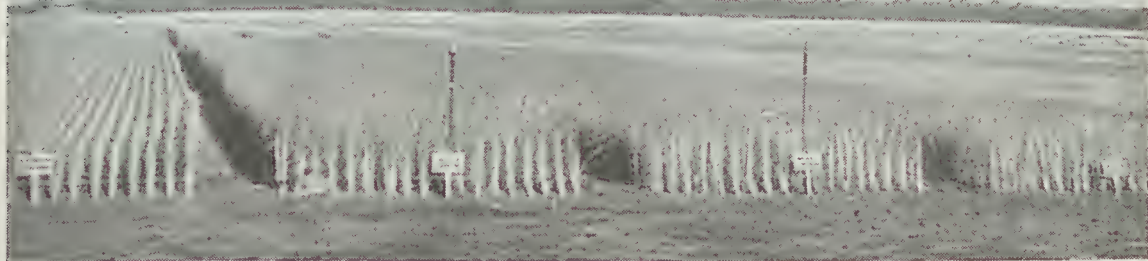
STUD STOCK IMPORTATIONS TO VICTORIA—1947-48.

	United Kingdom.		New Zealand.	
	Males.	Females.	Males.	Females.
CATTLE.				
Aberdeen Angus	1	4	3	4
Hereford ..	1	2	..	..
Polled Hereford..	1	3	8	..
Dairy Shorthorn	1	..	..	..
Red Poll ..	1	..	..	..
Ayrshire ..	..	..	2	..
Friesian ..	..	..	6	2
Jersey ..	1	..	1	..
Pigs.				
Berkshire ..	..	..	1	2
Large Black ..	..	..	1	..
Large White ..	..	3	1	..
Middle White ..	1	..	..	..
SHEEP.				
Border Leicester	2	..	2	..
Cheviot ..	..	..	2	..
Corriedale ..	..	..	3	2
Dorset Horn ..	5	28	..	..
English Leicester	..	..	3	..
Lincoln ..	..	..	2	..
Romney Marsh ..	3	19	22	374
South Down ..	1	4	1	5



MALLEE RESEARCH STATION

Experimental Work and Results



The following account of experimental work conducted at the Mallee Research Station and other Mallee centres was prepared by Messrs. H. L. Hore, B.Agr.Sc., Senior Agronomist; H. J. Sims, M.Agr.Sc., Cerealist; and J. M. McCann, B.Agr.Sc., Manager of the Station. This article is to be included in a guide book which will be available for general distribution.

THE Mallee Research Station at Walpeup was established in 1932 to serve as a centre for research and investigation into wheat growing and allied problems in the Mallee district of Victoria. Centred two miles from Walpeup, the Station comprises 2,556 acres, of which 1,550 acres are now available for cropping, the remainder being as yet uncleared, or reserved for wind-breaks and shelter purposes. Approximately 700 acres of the cleared land have been under cultivation for about 30 years, while 850 acres have been developed from timbered land since 1932. For sheep experimental work, additional grazing is leased on an adjacent property.

The principal soil types on the Station range from medium loams to light sands. The former occurs on land which was originally covered with pine or belar, and the latter soil type, which predominates on the western portion of the property, was originally under small mallee, acacia, and porcupine grass. Both of these soil types are very liable to erosion by wind. There are also patches of heavy mallee, plain, and limestone soils on the Station.

The main work of the Research Station has been the testing of wheat and oat varieties and crossbreds, the production of new varieties and investigations into cultivation, manurial, seeding, time-of-sowing, and disease problems in connexion with cereal growing. Crop rotation and the maintenance of soil fertility have also been the subject of special research.

An important phase of the Station's work is the production and sale of pedigreed seed wheat, oats, and rye. In the past, demand for such seed has greatly exceeded the available supplies. **The production of the new varieties, Insignia wheat and Orient oats, constitute important achievements for the Station and the Mallee.**

In view of the importance of sheep in Mallee agriculture, much attention has been given to investigations concerning the most suitable types of ewes and sires for fat-lamb production. Sheep management studies have included those of drought feeding and supplementary feeding in lean periods, particularly the autumn.

In an effort to improve the standard of pastures, many types of pasture plants have been tested. Some of these are of

local origin, but the majority are from other States and overseas. Special attention is being given to varieties and strains of medics.

Intensive investigations have been conducted into the problem of soil drift, but the continuity of this work was interrupted by the war.

The work of the Station is supplemented by subsidiary experimental plots on farmers' properties at Woomelang (Mr. A. E. Barbary), Ultima (Mr. T. W. Atkin), Berriwillock (Mr. J. T. Drury), Manangatang (Mr. W. L. Turner), and Murrayville (Mr. E. S. Schultz).

During the comparatively short life of the Station, sixteen years (which includes the war period), a large volume of precise information on Mallee agriculture and its problems has been collected and tabulated. The main features of this work are given in the following report.

SEASONAL CONDITIONS, 1948

Rainfall at Walpeup for the past 37 years has averaged 1263 points. The 1947 total was 3 inches above this average, largely due to heavy December rains which promoted the growth of summer weeds on fallows. The first three months of this year were very dry, and there was no opportunity for cultivation of fallows to control paddy melons, heliotrope, mustard, and other weeds which came away rapidly after the December rains. Good opening rains were received in the second week in April and these were followed up at nicely-spaced intervals by further soaking rains in May, June, and late July.

Another favourable factor up to the end of July was the comparative absence of high winds which so often cause sand-blasting of crops on exposed areas. At this stage, seasonal prospects were particularly bright, and, with average spring rains, good yields should be obtained.

The monthly rainfall for the present year and for the past four years, together with the 37-year average is as follows:—

Month.	1948.	1947.	1946.	1945.	1944.	Average 37 Years.
January ..	16	4	122	1	20	67
February ..	20	210	257	19	18	107
March ..	8	197	187	1	39	78
April ..	115	35	22	..	47	70
May ..	156	28	66	55	156	117
June ..	152	97	121	295	16	130
July ..	99	194	123	106	97	118
August ..	..	134	104	156	16	128
September ..	..	105	49	41	48	129
October ..	..	173	30	156	89	133
November..	..	122	94	64	53	89
December ..	..	260	26	104	106	97
Totals ..	..	1,559	1,201	998	705	1,263
Period— April to October	..	766	515	809	469	825

In early autumn paddock feed for stock became scarce, and handfeeding was resorted to on some farms before the break in April. The comparatively early opening, coupled with good follow-up rains, assured an abundant supply of winter feed.

The 1948 lambing took place under very favourable conditions, and the first truck of fat lambs from the Station was "lifted" in the middle of August.

To obtain exact data with respect to the various climatic factors of the district, a meteorological sub-station was established in 1939 and daily records of temperature (maximum and minimum), relative humidity, evaporation, and wind-run are kept. The relationship between rainfall and evaporation is particularly important. Strong winds



Farmers inspecting a crop of Insignia on the Station.



Sowing district cereal experimental plots.

following rain, and high temperatures cause a large percentage of moisture to be dissipated by evaporation. The average evaporation from a free-water surface for the nine years these records have been kept, has been 63.03 inches per annum.

Pure Seed Production

The production of pure seed for distribution to farmers is a feature of the Research Station's activities. In 1948, special attention is again being given to the production of seed of the recently-released varieties—Insignia wheat and Orient oats—but limited quantities of Bencubbin wheat and Dawn oats will also be available.

SUMMARY OF EXPERIMENTAL WORK

During the war, the scope of the experimental work had to be reduced, and it has not yet been possible to re-establish all the work previously in progress. Experimental work has provided information on the following matters:—

A. *Experiments with Cereals and Crop Plants*

- (1) Variety trials, with wheat, oats, and barley—for grain or hay—including the breeding and testing of crossbreds and selections, and recently-named varieties from other States.

- (2) Manurial trials with wheat and oats, and residual manurial trials with oats.
- (3) Rate of seeding trials with wheat and oats, and time of sowing trials with wheat.
- (4) Cultivation trials with wheat and oats.
- (5) Permanent rotation trials embodying two, three, and four-course rotations, and other trials to determine the effect on soil fertility of cropping systems and soil preparation.
- (6) Oat grazing and recovery trials.
- (7) Disease investigations, including the determination of resistance to flag smut of all crossbreds and varieties; effect of fertilizer on resistance to flag smut, testing the efficacy of pickling powders for the control of bunt, and testing the effect of these powders on germination and growth of the plant, and the use of modified hot-water treatments in loose smut control of wheat.
- (8) Various technical studies—crop growth studies, outside row effect in plots, &c.
- (9) Trials with field peas.
- (10) Observational trials with possible oil-producing crops—linseed and safflower.



The Director of Agriculture, Mr. H. A. Mullett, opening the Field Day last year.

Design of Cereal Experiments

In order that different soil conditions should not affect the comparison between plots, it has been found advisable to repeat or replicate each plot in a trial, rather than to use the older "single plot" method of testing. In the system adopted, which is known as the "Randomized Block System", plots are smaller than were used for single-plot testing, and each variety or treatment is sown once in a block of plots, and

each block is repeated, usually four times. This system enables more accurate comparisons to be made between varieties or treatments, and the results to be examined statistically for significance. All cereal experimental results referred to in this report are those from replicated plots.

The Randomized Block System is designed primarily to test only one variable, i.e., different varieties, or different manurial treatments. However, much of the information required involves the consideration of more than one factor—e.g., does the rate of seeding or the time of sowing affect the manurial requirement of the plant?

Therefore, some trials have been sown on a design that enables such comparisons to be made. This modification is known as "Factorial Design".

The yields per acre quoted in this report are those actually harvested from the plots. Such yields are considerably higher (up to 20 per cent.) than would be the case if it were not necessary to have paths between the plots. Much sampling of plots has been done to ascertain if there has been a differential response by varieties or rate of seeding, to this pathway effect, but no indication of any such effect has been found, and overseas literature shows the same result. However, when studying the figures, due allowance should be made for this pathway effect.

B. *Investigation into Fodder Crops and Pastures for the Mallee*

- (1) Plant nursery—preliminary testing of new pasture species from various sources, and the selection of plants under local conditions.
- (2) Field tests—testing promising species under field conditions.

C. *Sand Drift Investigations*

- (1) Control measures on cultivated land.
- (2) Control measures on non-cultivated land.
- (3) The stabilization of badly-eroded areas in co-operation with farmers in various districts.
- (4) Technical studies, measurements of amounts of erosion from cultivated land, studies of basic causes of erosion.

D. *Sheep Experiments*

- (1) The mating of strong-woolled merino ewes with various breeds of rams to determine—
 - (a) the comparative suitability of the half-bred ewe progeny as mothers for fat-lamb production;
 - (b) the comparative suitability of the wether progeny as fat or carry-over lambs under Mallee conditions.
- (2) The mating of crossbred ewes with different breeds of rams to compare the progeny as fat lambs.
- (3) Investigations on the supplementary feeding of ewes.
- (4) Investigations on the drought feeding of ewes and carry-over lambs.

CEREAL EXPERIMENTAL WORK

Wheat is by far the most important crop in the Mallee. The area sown to wheat in the Mallee is approximately half the Victorian acreage, and production is about one-third of the Victorian total yield. Oats are sown on about 350,000 acres, compared with approximately 1,300,000 acres of wheat. Barley production in the Mallee is confined principally to the Rainbow, Beulah, and Hopetoun districts.

The production of new, superior varieties of wheat and oats by hybridization and selection, and their subsequent development and testing, provides one of the most important and extensive aspects of the research work being conducted on the Station.

WHEAT

Wheat Variety Trials

In this section, standard varieties and promising new crossbreds are tested, both at the Research Station, and at the associated farmers' plots. The results of these trials are summarized in Table 1. It will be seen that Insignia has given highest yields at most centres where plots are conducted. At Manangatang it has been outyielded by Bencubbin, and at Murrayville by Quadrat, but at each of these centres the results must be regarded as inconclusive, due to the short period of testing (two years only).

Bencubbin has given better yields than the remainder of the early-maturing varieties,

including Regalia and Rancee 4H, while Quadrat has been the best of the mid-season to late varieties. In the main, the later-maturing varieties have not yielded as well as the earlier-maturing types. Diadem, where tested, has given yields slightly higher than those from Pindar, which, in turn, is superior to its parent variety, Ghurka, now dropped from Mallee plots. Pinnacle (a selection from Pindar) released for Wimmera sowing in 1946, has given yields very similar to Pindar in Mallee tests. Ghurka x Pusa 4 V9-2 is of particularly good flour quality, and is being multiplied for commercial testing. As its yielding ability is below that of the standard wheats, payment of a premium for quality is being considered by the Victorian Mill-owners' Association.

Javelin is a wheat named in 1942 by Roseworthy College from a cross between Onas and Nabawa. It produces flour of good quality and its yields to date have been encouraging, although last season it showed a high degree of susceptibility to rust.

RECOMMENDED WHEAT VARIETIES FOR MALLEE SOWING

Each year, the Victorian Wheat Advisory Committee, consisting of representatives of the wheatgrowers, millers, bakers, and the Department of Agriculture, after consideration of the yield performances, quality characteristics, disease resistance, and field characteristics of the various varieties, issues

TABLE 1.—WHEAT VARIETY TRIALS IN THE MALLEE.
Average Yields in bushels per acre.

Variety.	Mallee Research Station.			Woomelang.		Ultima.		Berri-willock.	Manangatang.	Murrayville.
	11 Years, 1937-47.	8 Years, 1940-47.	5 Years, 1943-47.	7 Years, 1941-47.	5 Years, 1943-47.	7 Years, 1941-47.	4 Years, 1944-47.	5 Years, 1943-47.	2 Years, 1946-47.	2 Years, 1946-47.
Insignia	..	17.8	13.6	19.2	17.4	12.1	12.5	17.1	24.4	17.0
Quadrat	21.1	16.6	13.2	14.6	14.0	9.5	9.5	15.7	20.6	18.6
Bencubbin	20.6	16.3	12.4	17.5	15.2	10.7	10.4	13.8	25.2	16.0
Regalia	19.8	15.3	10.8	16.7	14.3	10.5	9.7	14.5	18.6	13.2
Diadem	..	15.5	11.4	..	13.9	..	8.9	..	..	..
Ghurka x Pusa 4 M4510 V9-2 ..	..	15.2	10.7	..	14.4	..	10.8	..	20.4	..
Pindar	19.4	14.9	10.9	13.3	12.8	8.6	8.1	13.9	17.8	15.1
Rancee 4H.. ..	19.1	14.6	10.3	16.3	14.1	10.0	9.4	14.2	17.4	14.7
Javelin	..	..	11.7	..	..	..	10.6	..	20.4	16.8
Pinnacle	..	..	11.1	..	12.9	..	7.8	..	18.0	15.2

a table of recommended varieties for each district. The current recommendations for the Mallee are:—

Northern Mallee.—*Insignia*, *Bencubbin*, *Quadrat*, **Diadem*.

Central and Southern.—*Insignia*, *Bencubbin*, *Pindar*, *Quadrat*, and **Diadem*.

*Recommended for trial pending further evidence.

Insignia—The production at the Mallee Research Station of the wheat variety *Insignia*, is the most important result of the policy, initiated in 1932, of providing in the Mallee a district centre at which cereal breeding work could be intensified. It is expected that this variety will be widely sown in the Mallee during the next few years and contribute considerably to an increased yield per acre. *Insignia* was named and released in 1946, and, in 1947, it was sown on 60,000 acres or 4.1 per cent. of the area sown to wheat in the Mallee. It is an early wheat, maturing before either of its parents, *Ghurka* and *Ranee 4H*. *Insignia* has a short, strong straw, it is slightly taller than *Ghurka*, and stands better than most early types. It also has a good degree of resistance to flag smut, and is less susceptible to rust than *Ranee 4H*.



Typical heads of the new wheat—*Insignia*.

It produces a semi-compact, brown-chaffed head with short awns, and has proved easy to thresh at harvest without showing any tendency for the grain to crack. *Insignia* normally produces a medium-sized grain with flour at least equivalent in baking quality to its *Ranee* parent and superior to *Ghurka* and *Quadrat*. The evidence obtained to date with respect to its yielding ability in the Mallee proves it to be an outstanding variety. Following preliminary tests made prior to 1940, it has given consistent results in replicated trials at this Station and at the associated farmers' plots during the past seven years.

Quadrat is now the most popular wheat in the Mallee and all the other main wheat-growing districts of the State. In Mallee tests it has not proved equal to *Insignia* but it is the most prolific of the later-maturing types. It is a free-stripping, brown-chaffed variety with a strong straw, slightly taller than *Ghurka*, and normally produces a well-filled grain which does not crack readily.

Bencubbin, now well known to Mallee farmers, is second in popularity, being grown on 264,000 acres in the Mallee in 1947. It has given good yields at all Mallee centres and is favoured for its taller straw which enables it to be cut for hay if so desired. *Bencubbin* was bred in Western Australia from *Gluyas Early* and *Nabawa*. The straw weakness which it frequently exhibits is a disadvantage and for that reason it should be limited to areas which can be readily handled at harvest time.

Pindar was released from this Station in 1941, and has proved popular with Mallee wheat growers. In 1947, it was grown on 249,000 acres and ranked third in acreage in the Mallee. It is a selection from *Ghurka*, and is a distinct improvement on that variety in both prolificacy and flour quality. Furthermore, its grain is larger and more attractive. It is similar to *Ghurka* in disease resistance and field characteristics, except that it is slightly taller, and a little earlier in maturity. *Pindar* is recommended for sowing in the southern Mallee.

Diadem—This wheat, formerly the cross-bred *Ghurka* x *White Fife*, was developed at the State Research Farm, Werribee, and Longerenong College. It combines

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Wheat variety trial plots at Walpeup.

the prolificacy of Ghurka with the high-flour quality of White Fife. Departmental and semi-commercial tests have shown that Diadem is a medium-strong wheat producing a flour of relatively higher baking quality than Ghurka, Magnet, or Quadrat.

Regarding the yielding ability of Diadem in the Mallee the experimental results are limited as this variety was included in a number of Mallee district plots for the first time in 1947. At other Mallee centres, Diadem, while not outstanding, has returned higher yields than those obtained from a number of commonly-grown varieties. While not as yet recommended for general sowing, Diadem is worthy of a trial on limited areas on Mallee land.

Other varieties

Regalia, Rance 4H, and Ghurka are three well known wheats which have been prominent in the Mallee for many years but which are now on the decline in popularity.

Regalia was released from the Mallee Research Station in 1938. It is an early-maturing wheat and resembles Rance 4H in most characters, but has a bolder head with slightly more awn and a darker chaff. It shows to advantage in those years when good winter rains are followed by light spring rains.

Rance 4H has been regarded as the standard wheat for the central and northern Mallee for many years, and is still grown over a large area in the Millewa. It has a particularly attractive grain, and yields flour of better than average quality.

Ghurka was widely grown in the Mallee for many years, but has now been replaced to a large extent by Pindar and Quadrat. Ghurka has been extensively used as a parent in the wheat-breeding programme of the Department.

Table 2 sets out the percentage of the total area sown to each variety of wheat last year, and at other representative periods since the inception of the Walpeup Station. It will be seen that only three varieties which were in the first ten in 1931 are still included in the table—namely, Rance 4H, Ghurka, and Rajah. The table indicates the rapidity with which new wheats have displaced the older varieties.

TABLE 2.—TEN PRINCIPAL WHEAT VARIETIES SOWN IN THE MALLEE.

Variety.	Percentage 1947-48.	Percentage 1945-46.	Percentage 1940-41.	Percentage 1935-36.	Percentage 1931-32.
Quadrat ..	24.4	11.8	..	..	..
Pencubbin ..	18.0	12.8	7.7	0.3	..
Pindar ..	17.0	16.7	..	..	..
Ghurka ..	12.1	26.8	41.1	25.4	0.9
Rance 4H ..	9.6	12.1	27.7	18.2	18.5
Regalia ..	6.7	8.5	3.3	..	..
Insignia ..	4.1	..	..	..	..
Magnet ..	2.0	0.8	..	..	..
Bobin ..	1.3	1.9	2.9	0.7	..
Rajah ..	1.0	0.7	2.3	2.8	3.0

New varieties being tested, but which have not been tested in the "Senior Yield Trials" long enough to include in Table 1 are Koorda, Gabo, and Warigo.

Koorda was bred in Western Australia, it being a cross between Nizam and Nabawa. It is an early-maturing wheat, medium tall-growing, and has white-chaffed heads. It is very resistant to flag smut. The flour strength is about equal to that of Bencubbin.

Gabo, one of the most promising wheats introduced from other States, is a rust-resistant variety recently produced at Sydney University. Its parents are Robin and Gaza, and it derives its rust resistance from the latter. It is a short-strawed, early-maturing wheat which has a pronounced tip-beard and light-coloured chaff. This variety has come into prominence in the past two seasons when a light attack of stem rust in 1946 and an epidemic in 1947 focused attention upon rust-resistant varieties. The yield performance of Gabo in rust-free seasons will be watched with interest, and until such data is available it cannot be recommended for Mallee sowing.

Warigo was bred at the Waite Institute, Adelaide, and is a cross between Nabawa and Hope. It also is a rust-resistant variety which yielded well last season. Warigo is resistant also to flag smut, loose smut, and mildew.

In addition to the varieties included in Table 1, new varieties from other States are tested at Walpeup as soon as seed is obtained. These new varieties are tested in a series of plots which include leading standard Victorian wheats. If their yields in this trial are satisfactory, they are promoted to the Senior Yield Trial. Because the varieties in the former trial are frequently changed, the average yields over a long period cannot be given.

The yields of a number of new wheats from New South Wales, South Australia, and Western Australia, compared with Insignia and Quadrant, are shown in Table 3.

In 1946, a light attack of rust was experienced in the plots at Walpeup, but last season, the epidemic was so severe that the yields of varieties could be regarded more as a measure of degree of susceptibility or resistance to rust than of any other factor. It will be noted that, in consequence of this, Insignia and Quadrant, which themselves possess a slight degree of resistance to rust, were outyielded by a number of rust-resistant varieties, notably Gabo, Warigo, Charter, Kendee, and Yalta.

TABLE 3.—WHEAT VARIETY TRIAL.

Tests with Rust Resistant and other Varieties.

Variety.	Yield 1946, Light Rust Infection.	Yield 1947, Rust Epidemic.
	Bus./ac.	Bus./ac.
Gabo ..	26.7	19.0
Kendee ..	23.1	16.5
Insignia ..	22.9	13.9
Gular ..	22.9	14.4
Warigo ..	21.5	18.8
Charter ..	20.8	18.8
Frisco ..	20.8	18.1
Yalta ..	20.3	18.8
Quadrat ..	20.2	12.6
Kondut ..	19.5	11.8
Celebration ..	18.9	18.0
Ridley ..	18.8	9.3
Rancee 4H ..	16.4	8.4

Kendee was bred at Sydney University from a cross between Dundee and a rust-resistant variety, Kenya, which conferred its resistance on Kendee. It is of mid-season maturity, white-chaffed, and produces grain of good flour quality.

Charter was released in 1944 by the New South Wales Department of Agriculture. It was bred at Glen Innes from a cross between an unnamed Kenya wheat and Gular. It is a tall-growing, white-chaffed, very early maturing wheat, and produces grain of good flour quality.

Gular, also, was bred by the New South Wales Department of Agriculture. It is a very early maturing variety. In most seasons it shows a definite straw weakness. The grain is usually vitreous, and the baking quality of the flour is very good.

Discarded Varieties

Variety tests in the past have resulted in the elimination of many wheats owing to lower-yielding ability, poor grain quality, disease susceptibility, or other factors. The wheats now eliminated from the yield trials include Federation, Early Gluyas, Mac's White, Yandilla King, Currawa, Nabawa, Joffre, Sepoy, Waratah, Ghurka, Free Gallipoli, Magnet, Carrabin, Ford, Baringa, Merredin, Riverina, Totadgin, Nawab, Sword, Rapier, Bobin, Scimitar, Puora, Amity, Eureka, Koala, Waria, Gluwari, and Seewari.

Tests on Stubble Land

The area of wheat crop in the Mallee sown on stubble land each year varies according to seasonal conditions but averages in the vicinity of 15 per cent. of the total area sown to wheat. To provide information on crops sown under these conditions, wheat variety trials on stubble land were introduced. The results obtained over a six-year period indicate that an early-maturing wheat is desirable for stubble sowing.

TABLE 4.—WHEAT VARIETY TRIALS ON STUBBLE.

Variety.		Average Two Years, 1946-47.	Average Six Years, 1937-40 and 1946-47.
		bus./ac.	bus./ac.
Insignia	..	13.4	..
Quadrat	..	11.2	..
Bencubbin	..	10.0	10.2
Ghurka	..	8.5	9.5
Regalia ..	..	8.2	10.0
Rance 4H	..	7.6	9.8
Pindar ..	..	7.2	..
Pinnacle	..	7.0	..

Stud Plots

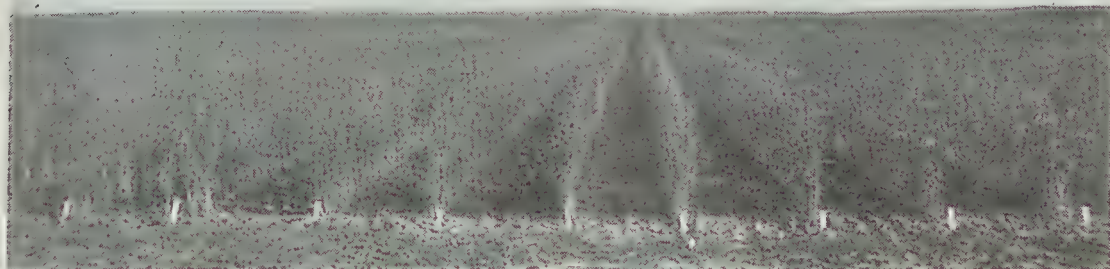
Each year a number of plants considered to be desirable parents are mated at the State Research Farm, Werribee, the progeny being grown and studied in the nursery rows of the stud cereal section at Walpeup. These rows are subjected to drastic culling by the plant breeder, and only those plants exhibiting desirable characters are retained for further selection and testing.

A special milling test (Pelshenke Test) enables the lines of low-flour quality to be eliminated, and a special section is sown to test the resistance of new crossbreds to flag smut. The selection work is continued for a number of years until only a few of the more promising true breeding strains of the original population are left. These are then grown in seed multiplication plots and finally pass to the larger field plots for accurate testing to determine their yielding capacity.

Wheat Manurial Trials

During the years 1933-40, trials with wheat on fallow were sown to test several rates of application of superphosphate per acre at each of three times of sowing (a) early, April; (b) mid-season, May; and (c) late, June. A different site for the tests was chosen each year, the crop before the fallow being a stubble crop of oats sown with a light dressing of superphosphate. The results of these trials are set out in Table 5, and the marked response to superphosphate at each sowing is evident.

It will be seen by an examination of the following table that an increase in the yield of wheat was obtained with each addition in the amount of superphosphate applied at each time of sowing. Moreover, and contrary to a generally accepted idea, the tests over eight years indicate that early-sown crops require superphosphate to as great an extent as do those sown later. An equally good response is obtained to the application of superphosphate at an early sowing as at a later sowing.



Stud rows of wheat and oats.

During the years 1936-40, dressings of 150 lb. per acre were included in the test to determine if a further increase in yield was obtainable. The application of 150 lb. of superphosphate per acre did not materially alter the yield from that obtained with 120 lb. per acre.

In 1940, manurial trials were established on permanent sites, to obtain information on the long term effects of superphosphate applications. The rotation of these three permanent sites is wheat-oats-fallow, no superphosphate being sown with the oats. The results obtained to date are shown in Table 6, but the experiment has not been established long enough for the determination of trends in yields.

TABLE 5.—WHEAT MANURIAL TRIALS (replicated).

(Average 8 years, 1933 to 1940—Yields in bushels per acre.)

Treatment.	Sown Early.	Sown Mid-season.	Sown Late.	Average of Three Times of Sowing.
No manure ..	22.2	21.8	16.6	20.2
Superphosphate—				
30 lb./ac. ..	25.1	24.1	19.3	22.8
60 lb./ac. ..	27.2	25.4	20.6	24.4
90 lb./ac. ..	28.3	26.2	21.5	25.3
120 lb./ac. ..	29.2	27.0	22.2	26.2
Average yield ..	26.4	24.9	20.0	23.8

TABLE 6.—PERMANENT MANURIAL TRIALS. (Average results 8 years, 1940 to 1947—Yields in bushels per acre.)

Treatment.	Average Yield.
No manure ..	12.2
Superphosphate—	
30 lb./ac. ..	14.2
60 lb./ac. ..	15.0
90 lb./ac. ..	15.5
120 lb./ac. ..	15.5

Economic Use of Superphosphate

The results of mid-season sowings of manurial trials for 23 years are shown in Table 7. This table shows the increased returns which may be expected from various applications of superphosphate. To counter-balance the effect of the outside row, the plot yields as obtained, have been reduced by 12½ per cent.—an amount by which it has been found yields are increased in plots of this size due to the outside row effect. Wheat has been valued at 5s. per bushel on the farm, and 22 per cent. superphosphate at £6 10s. per ton on the farm.

From the figures in Table 7, it appears that, under conditions similar to those at Walpeup, the most profitable dressing for wheat on fallow is about 90 lb. per acre when the wheat and superphosphate are valued at the prices shown above.



Inspecting wheat variety plots at the Mallee Research Station.

Burnley Egg-Laying Competition

Results of Winter Test

By Martin D. Hall, Poultry Expert

THE thirty-eighth egg-laying competition for fowls, conducted by the Department of Agriculture at the School of Primary Agriculture and Horticulture, Burnley, commenced on the 1st April, 1948, and will continue until the 2nd March, 1949, a period of 48 weeks.

The winter test, conducted in conjunction with this competition, included the first four months (122 days), and concluded on 31st July. This test is held annually to give prominence to birds that lay well during the period when eggs are scarce and prices are high. It is considered that egg production on commercial poultry farms could be improved by breeding from birds that have laid well during the autumn and winter months, and those that lay consistently during that period usually continue to do so at other times of the year. Birds used for breeding purposes should conform to the standard of the breed in size, colour, and body conformation. They should also have laid a large number of first-grade eggs of normal shape and good-quality shell texture. However, it is well to bear in mind that selection is the basis of all improvement.

Certificates are awarded for the greatest number of first-grade eggs laid by the three leading birds in all classes, provided a bird lays a minimum of 60 first-grade eggs or more. It is interesting to note that 58.9 per cent. of the birds laid 60 eggs or more. During the first two months of the test, a first-grade egg must weigh not less than $1\frac{3}{4}$ oz., and thereafter not less than 2 oz.

The Australorps, wet mash, set a high standard, four birds having laid 100 or more first-grade eggs. The White Leghorns in the wet-mash section also gave an excellent account of themselves, three birds having laid 100 or more first-grade eggs, and thirteen others laid 90 or more first-grade

eggs. The winning birds in Class 3—White Leghorns—Wet Mash, and Class 4—Australorps—Wet Mash, both laid 110 first-grade eggs.

Legbars, one of the most popular of the auto-sexing breeds are increasing in popularity, and twelve birds have been entered in this year's competition.

INDIVIDUAL BIRDS—SINGLE TEST

In the class for White Leghorns fed on wet mash, Messrs Goddard and Harvey won first prize with a bird that laid 110 first-grade eggs; Mr. H. E. Hill's entry was second with 108 eggs; and Gibb's Highway Stud gained third prize with a bird that laid 103 eggs.

In the White Leghorn class fed on dry mash, first prize went to a bird entered by Mr. W. H. Clements that laid 102 first-grade eggs. The same competitor shared equal first prize in this class during last year's competition. Mr. G. Moran gained second prize with a bird that laid 100 eggs, and Mr. A. A. Skinner's entry won third prize with 99 eggs.

First prize in the class for Australorps was awarded to Mr. W. S. Paton, whose bird laid 110 first-grade eggs. Mr. S. H. Hanson gained second prize with a bird that laid 106 eggs, and third prize went to Mr. E. C. Davis, whose bird laid 103 eggs.

Mr. D. R. Fraser and Grenville Stud Farm shared equal first prize in the Rhode Island Red class, both of whose birds laid 96 first-grade eggs. Third prize was awarded to Mr. J. Wear's entry which laid 94 eggs.

In the class for light breeds other than white Leghorns, wet mash, first prize was awarded to Mr. H. L. Kemp, whose Legbar laid 89 first-grade eggs. Mr. C. J. Woollett's

Legbar won second prize with a score of 87 eggs, and Mr. J. Doull gained third prize with a Legbar that laid 85 eggs.

First prize in the class for heavy breeds other than Australorps and Rhode Island Reds, wet mash, was awarded to Mr. W.

Cocking, with a Light Sussex that laid 80 first-grade eggs, while Mr. J. Lang's Langshan gained second prize with a score of 65 eggs. As only two birds laid more than 60 first-grade eggs, first and second prizes only were awarded.

Winter Test Prize List, 1948-49 Competition

INDIVIDUAL BIRDS—SINGLE TEST

Pen No.	Name and Address.	Total Eggs.	Under-weight.	First Grade Eggs.
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Class 1.—White Leghorns—Wet Mash.

FIRST PRIZE—CHAMPION CERTIFICATE.

146	Goddard and Harvey, 356 High-street, Bendigo	112	2	110
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SECOND PRIZE—GOVERNMENT CERTIFICATE.

147	H. E. Hill, 20 Turner-street, North Wonthaggi	112	4	108
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THIRD PRIZE—GOVERNMENT CERTIFICATE.

142	Gibb's Highway Stud, J. L. Gibbs, Main Eltham-road, Lower Plenty	103	..	103
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Class 2.—White Leghorns—Dry Mash.

FIRST PRIZE—CHAMPION CERTIFICATE.

205	W. H. Clements, 7 Crown-road, Ivanhoe	102	..	102
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SECOND PRIZE—GOVERNMENT CERTIFICATE.

230	G. Moran, Glenburnie-road, Mitcham	100	..	100
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THIRD PRIZE—GOVERNMENT CERTIFICATE.

235	A. A. Skinner, 75 Vincent-street, Sandringham, S.8	100	1	99
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Class 4.—Australorps—Wet Mash.

FIRST PRIZE—CHAMPION CERTIFICATE.

35	W. S. Paton, Glenburnie-road, Mitcham	116	6	110
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SECOND PRIZE—GOVERNMENT CERTIFICATE.

31	S. H. Hanson, Box 7, Kilmore	106	..	106
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THIRD PRIZE—GOVERNMENT CERTIFICATE.

15	E. C. Davis, 91 Flinders-street, Thornbury	104	1	103
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Class 3.—Light Breeds, other than White Leghorns—Wet Mash.

FIRST PRIZE—CHAMPION CERTIFICATE.

116	H. L. Kemp, Glenmargon, Whitehorse-road, Ringwood East (Legbar)	90	1	89
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SECOND PRIZE—GOVERNMENT CERTIFICATE.

126	C. J. Woollett, 79 King-street, Canterbury, New South Wales (Legbar)	87	..	87
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THIRD PRIZE—GOVERNMENT CERTIFICATE.

105	J. Doull, 35 Collingwood-road, Newport (Legbar)	85	..	85
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Class 5.—Rhode Island Reds—Wet Mash.

EQUAL FIRST PRIZE—CHAMPION CERTIFICATE.

76	D. R. Fraser, Colchester-road, Kilsyth	97	1	96
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EQUAL FIRST PRIZE—CHAMPION CERTIFICATE.

80	Grenville Stud Poultry Farm, Springvale-road, Springvale South	97	1	96
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THIRD PRIZE—GOVERNMENT CERTIFICATE.

98	J. Wear, Farm-road, Werribee	98	4	94
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Class 5.—All Heavy Breeds, other than Australorps and Rhode Island Reds—Wet Mash.

FIRST PRIZE—CHAMPION CERTIFICATE.

54	W. Cocking, Kilmore East (Light Sussex)	81	1	80
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SECOND PRIZE—GOVERNMENT CERTIFICATE.

58	J. Lang, 46 Dundas-street, Thornbury, N.17 (Langshan)	98	33	65
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(As only two birds laid more than 60 first-grade eggs, first and second prizes only were awarded.)



IN THE ORCHARD

By G. W. Gayford, B.Agr.Sc., Senior Horticultural Instructor

BIENNIAL BEARING IN FRUIT TREES

FRUITGROWERS, and apple growers in particular, will need no long dissertation on the disadvantages of alternate bearing. The alternation of years of heavy crops and low prices, followed by seasons of high prices, but very little fruit, has been the common experience for a number of years, and the condition during the last year or two seems to have worsened. In fact, it may be described as a major problem of the apple industry. Other kinds of fruit are also affected. The advantages of annual production are equally obvious.

In leading up to a brief discussion on this problem of biennial or alternate bearing, it may be of some value to outline what happens after blossoming is complete and the fruit has set. First of all, immediately after flowering, all the blossoms which have not been fertilized fall off the tree. The remaining small fruits then gradually increase in size until December, when another fall of fruit normally occurs. This drop consists of fruit which is imperfectly formed.

For instance, apples or pears which are not completely fertilized or pollinated, and have only two or three ovules fertilized instead of the normal five complete ovules, fall off the tree at this stage. These two periods of dropping are quite normal in the life of the tree, and, if other conditions are normal, a satisfactory commercial crop remains. In fact, for a profitable crop to be obtained it is necessary for only 5 to 10 per cent. of the total number of blossoms to set fruit which will remain until maturity.

It is during this period, from bud-burst until about December, that shoot-growth occurs. This is usually completed by December, although, in young trees, it may be continued beyond this period. In mature trees, another highly important development in the life of the tree occurs. This is the development of flower buds which will produce blossoms in the following season, and the condition of the tree at this particular stage will have a considerable effect on the yield of the next crop. The production within the buds of the tiny cells which, in about nine months will

blossom forth in a spectacular blaze of beauty, usually passes unnoticed even by orchardists to whom it is obviously of great significance.

BLOSSOM INITIATION

The condition known as biennial or alternate bearing is, to some extent, linked with this process of blossom initiation. It appears that, for the tiny blossom-producing cells to be formed, a relatively large amount of carbohydrate or starch and sugar manufactured by the leaves must be present in the spurs or shoots, in comparison with the nitrogen which is obtained from the roots. Obviously then, if the tree is already carrying a heavy crop of fruit, making large demands on the tree's supply of sugars and starches, the production of blossom buds will be reduced.

Another point is that the tree which carries a heavy crop of young fruit has less leaves than a tree with a light crop. The leaves are the starch factory of the tree, and this means that the amount of carbohydrate being produced in a heavily-cropped tree is less than in the tree carrying the light crop. The capacity to produce a heavy crop one year, followed by a very light one, varies with the different varieties and is usually worst in apple varieties which bear most of their fruit on spurs such as Rokewood, Dunns, London Pippin, and Stewart's Seedling. Lateral bearers, such as Jonathan and Yates are not so severely affected. However, all fruit trees which suffer some setback such as thrips attack, frost, or drought in one season, tend to switch over to this form of alternate bearing, and this may continue for a number of years.

Flower-bud formation normally does not occur on spurs or shoots which are already carrying fruit, so that trees which have a balance between shoots and spurs which carry fruit, and those which are carrying leaf growth only, produce regular annual crops.

PRUNING AS A MEANS OF CONTROL

What means are there available to the grower then to control this alternate bearing? The operations of pruning, fertilizer application, fruit-thinning, and

de-blossoming sprays may all be used with some effect, although there is no complete answer to the problem.

Pruning has been used with some success on biennial-bearing trees. Heavy pruning in the "on" year reduces the number of flower buds. Severe thinning out of spurs over a number of years may also result in more flowers being formed on shoot growth. However, on a practical scale, pruning is rarely done severely enough to prevent the trouble.

The application of nitrogenous fertilizers just before blossoming assists the blossom to set. By withholding fertilizers during the heavy blossoming year, and applying them only on the light year, the set of fruit in the light year may be increased. The use of this method, although of some value, cannot be expected to correct alternate bearing.

HAND THINNING

Hand thinning of fruit is a normal routine for some varieties, such as the Yates apple and the Winter Cole pear, which usually set fruit in profusion, and the operation is essential in order to obtain fruit of a size large enough for marketing. It is also usual to thin out fruits on any trees which have set an abnormally heavy crop to obtain fruit of marketable size. This work is usually done after the second period of natural dropping is complete, because it is not always possible to tell just how extensive this will be and how much fruit is likely to remain on the tree. It has been found, however, that, as far as the effect on alternate bearing is concerned, thinning the fruit at this time of the year has little effect. In order to produce practical results, the thinning must be carried out soon after flowering and must be very severe. Because of the labour involved, this method is likely to be costly.

CONTROL BY SPRAYING

The use of sprays to control the blossoming of the fruit offers one of the cheapest means of overcoming the problem. At the present time, Victorian apple growers have used, on a fairly extensive scale, sprays such as cresylic acid (1½ per cent.), tar distillate (3 per cent.), or DNC sprays (2 per cent.) for the purpose of destroying the blossom

during the "on" year and so transferring the cropping on the area treated to the "off" year. Obviously this means that the crop will be obtained when fruit is in short supply and would have advantages both for the producer and consumer. However, this treatment doesn't solve the problem of biennial bearing because the nature of the sprays are such that all the blossom is destroyed. If, by chance, any flowers set fruit, this is usually damaged by the spray. Recently, we have had information from the United States concerning a new type of spray which may be used to thin out some of the blossoms. This would appear to be an ideal method of dealing with trees which suffer from the habit of alternate bearing, and experiments are being carried out this year to determine the effect of these chemicals.

BLACK SPOT ON APPLES AND PEARS

The diseases, black spot of the apple (*Venturia inaequalis*) and black spot of the pear (*Venturia pirina*) are similar in effect and life history. Both types of fungus live through the winter in old infected leaves and when the temperature commences to rise in the spring, and, provided the leaves are damp for a sufficient period, spores are discharged into the atmosphere where they are blown around by wind and eventually alight on the fruit trees. If the buds have burst and young green leaf or flower tissue is exposed, the spores will germinate if they are kept in a moist condition for eight hours. It will be seen, therefore, that a warm wet spring will be favorable for spore discharge and germination on the opening apple and pear buds.

Two important control measures should be adopted to reduce damage by these

diseases to a minimum. Firstly, remove as much as possible of the source of infection by ploughing the leaves under before bud-burst. If ploughing is delayed because of wet soil conditions, neither soil nor leaves should be disturbed during the flowering period, as this would increase spore discharge. Secondly, the developing leaves and flowers should be protected with spray materials to prevent germination of any spores which happen to be present.

The first spray for apples should be applied as soon as the majority of the buds have opened and the tips of the young leaves are just visible. A slightly later stage is the best time for the first spray on pears. Bordeaux mixture, strength 6:4:40, is the best spray for this stage. The development of leaves and flowers is fairly rapid, and the plant tissue must obviously grow away from this first cover of spray.

Another spray, lime sulphur $2\frac{1}{2}/80$ gallons for apples, is necessary at the "pink" or 5-10 per cent. blossom stage for apples, and this should provide protection during the blossoming period. A further spray of lime sulphur, $1\frac{1}{2}/80$ at petal fall, should result in adequate protection during this vital period.

For pears, the second spray is applied at the stage when the blossom buds are beginning to separate in the cluster, but before any white petals appear. A further spray of Bordeaux at a period two to three weeks after petal fall, should sterilize any infection which occurred during the blossoming period. For pears, the strength of sprays varies according to variety. For more detailed information on these sprays and other aspects of black spot control, the leaflet, "Black Spot on Apples and Pears," is available free on application to the Department.





POULTRY FEEDING TESTS

1947-48

By M. D. Hall, Poultry Expert, and A. G. Clark, Poultry Foreman

EXTENDING over a period of twelve months from 1st April, 1947, to 31st March, 1948, poultry feeding tests were conducted at the State Research Farm, Werribee, to test the comparative values of wheat and oats as a complete grain ration for laying fowls.

For the purpose, 250 Australorp and 250 White Leghorn pullets, hatched in August and September, 1946, were used and divided into pens each containing 50 birds. The birds were intensively housed in a laying shed 110 ft. long and 20 ft. deep, divided into 10 pens each 11 ft. by 20 ft. providing a little over four square feet of floor space per bird.

THE RATIONS

In the course of the test, the following rations were fed:—

Pens No. 1 (Australorp) and 9 (White Leghorn)

Dry mash (30 lb. bran, 60 lb. pollard, 10 lb. meatmeal) always available in hoppers; free choice wheat in hoppers; greenfeed.

Pens No. 2 (Australorp) and 10 (White Leghorn)

Dry mash (30 lb. bran, 60 lb. pollard; 10 lb. meatmeal) always available in hoppers; free choice oats in hoppers; greenfeed.

Pens No. 3 (Australorp) and 8 (White Leghorn)

Control pen; dry mash (30 lb. bran, 60 lb. pollard, 10 lb. meatmeal) always available in hoppers; mixed grain (4 parts wheat, 1 part oats, 1 part barley) fed in litter; greenfeed.

Pens No. 4 (Australorp) and 6 (White Leghorn)

Wet mash (30 lb. bran, 60 lb. pollard, 10 lb. meatmeal) always available in hoppers; free choice wheat in hoppers; greenfeed.

Pens No. 5 (Australorp) and 7 (White Leghorn)

Wet mash (30 lb. bran, 60 lb. pollard, 10 lb. meatmeal) always available in hoppers; free choice oats in hoppers; greenfeed.

Shell grit was always available in all the pens.

As in previous tests, the cost of food was arrived at by taking the average wholesale prices published in the daily press during the year. Delivery charges were not added. The eggs laid were valued at the gross wholesale hen-egg price without deducting any marketing or grading charges. These charges would probably average approximately 5d. per dozen, which with an average production of 15 dozen eggs would amount to 6s. 3d. per bird per year.

The cost of rearing the birds was not taken into account, as all those used in the tests were reared on free-range and kept there until they were drafted into the pens just prior to the commencement of the test. Losses of birds through accident and various other causes cannot be accurately recorded. This and other factors make it difficult to assess the exact amount.

The conditions under which the tests were conducted were rather unfavorable, as it was difficult to obtain supplies of meatmeal with the usual high percentage of protein. The health of the birds throughout the tests was excellent. The mortality rate, 5.4 per cent. was low and evenly distributed throughout the pens.

CONCLUSIONS

The tests have shown that oats may be used as a complete grain ration for laying fowls. The slightly lower production in the pens where oats were fed may lend support to the theory that the difference in food value between oats and wheat is equivalent to the amount of husk contained in the oats. The excellent results obtained

in Control Pens Nos. 3 and 8 is probably due to added variety in the ration obtained by feeding mixed grains.

The outstanding performance of the birds in No. 4 pen, fed wheat only, is not supported by the other groups fed on a similar ration. Such performances are not unusual in feeding tests, and it is quite possible that a number of high-producing pullets were grouped together in this particular pen.

An interesting feature was the regular amounts of food consumed in all pens. The theory concerning the unpalatability of oats is not borne out in these tests, as the difference in the consumption of wheat and oats is negligible.

A good quality oat was fed throughout the tests. This appears to be an important factor in the feeding of oats to poultry.

The amounts of grain consumed in the pens which were fed either free-choice wheat or oats was considerably greater than that eaten by the birds in both control pens. The inference here is that birds prefer grain to mash. In the control pens where the birds were fed measured quantities of grain, they were obliged to eat additional amounts of mash in order to fulfil their normal requirements. Consequently a larger percentage of meatmeal was consumed, and this combined with a variety of grain may account for the increase in egg production in those pens.

The average cost of food was relative throughout the tests. This factor is of extreme importance, as it provides the poultry farmer with a wide range of feeding rations, and also gives him the choice of purchasing either wheat or oats according to availability of supplies and price of these grains.



TEST NO. 28.—WERRIBEE FEED TESTS, 1ST APRIL, 1947, TO 31ST MARCH, 1948 (12 MONTHS).

Pen No.	Fifty Birds per Pen.	System of Feeding.	Number of Birds Died.	Bran.	Pollard.	Meat-meal.	Wheat.	Oats.	Barley.	Total Food Consumed.	Cost of Food.	Eggs Laid.	Value of Eggs.	Return over Food Costs.
1	Australorps	Dry mash in hopper; free choice wheat in hopper; green feed	3	489	979	163	3,151	..	..	4,782	£ s. d. 20 13 11	8,612	£ s. d. 74 15 2	54 1 3
2	Australorps	Average	..	..	..	..	..	..	..	95.6	0 8 3	172.2	1 9 11	1 1 8
3	Australorps	Dry mash in hopper; free choice oats in hopper; green feed	3	517	1,033	172	..	3,037	..	4,759	21 17 6	8,182	71 0 6	49 3 0
4	Australorps	Average	..	..	..	..	..	..	..	95.2	0 8 9	163.6	1 8 5	0 19 8
5	Australorps	Control pen—dry mash in hopper; mixed grain in litter; green feed	3	731	1,463	244	1,584	396	396	4,814	20 1 5	9,402	81 12 3	61 10 10
6	Australorps	Average	..	..	..	..	..	..	..	96.3	0 8 0	188.0	1 12 7	1 4 7
7	Australorps	Wet mash; free choice wheat in hopper; green feed	2	549	1,098	183	2,975	..	..	4,805	20 2 5	10,436	90 11 10	70 9 5
8	Australorps	Average	..	..	..	..	..	..	..	96.1	0 8 1	203.7	1 16 3	1 8 2
9	Australorps	Wet mash; free choice oats in hopper; green feed	3	549	1,098	183	..	2,973	..	4,803	21 19 1	9,241	80 4 4	58 5 3
10	Australorps	Average	..	..	..	..	..	..	..	96.1	0 8 9	184.8	1 12 1	1 3 4
11	White Leghorns	Wet mash; free choice wheat in hopper; green feed	2	549	1,098	183	2,989	..	..	4,819	20 13 8	9,271	80 9 6	59 15 10
12	White Leghorns	Average	..	..	..	..	..	..	..	96.4	0 8 3	185.4	1 12 2	1 3 11
13	White Leghorns	Wet mash; free choice oats in hopper; green feed	2	549	1,098	183	..	2,967	..	4,797	21 18 5	8,921	77 8 9	55 10 4
14	White Leghorns	Average	..	..	..	..	..	..	..	95.9	0 8 9	178.4	1 11 0	1 2 3
15	White Leghorns	Control pen—dry mash in hopper; mixed grain in litter; green feed	2	725	1,449	241	1,584	396	396	4,791	19 19 9	9,224	89 1 5	60 1 8
16	White Leghorns	Average	..	..	..	..	..	..	..	95.8	0 8 0	184.5	1 12 0	1 4 0
17	White Leghorns	Dry mash in hopper; free choice wheat in hopper; green feed	3	510	1,029	170	3,130	..	..	4,830	20 17 2	8,560	74 6 1	53 8 11
18	White Leghorns	Average	..	..	..	..	..	..	..	96.6	0 8 4	171.2	1 9 9	1 1 5
19	White Leghorns	Dry mash in hopper; free choice oats in hopper; green feed	4	512	1,024	171	..	3,005	..	4,712	21 13 2	8,103	70 7 10	48 14 8
20	White Leghorns	Average.	..	..	..	..	..	..	..	94.2	0 8 8	162.2	1 8 2	0 19 6
21	White Leghorns	Total for 500 birds	..	..	..	..	..	..	..	47,912	209 16 6	89,958	780 17 8	571 1 2
22	White Leghorns	Average	..	..	..	..	..	..	..	95.8	0 8 5	179.9	1 11 3	1 2 10

NOTES.—Average gross price of eggs per doz., 2s. 1d.; food cost per doz. eggs, 61d.; food consumed per egg laid, 8.5 oz.; food consumed per bird per day, 4.2 oz.; cost of food per bird per week, 2d.

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TABLE 7.—WHEAT MANURIAL TRIALS.
(Average of 23 years—Mid-season sowings.)

Treatment.	Average Yields 23 Years.	Increase Due to Superphosphate.	Value of Increase at 5s. per Bushel.	Cost of Superphosphate at £6 10s. per Ton.	Extra Return Due to Superphosphate.
	bus. per acre.	bus. per acre.	per acre. s. d.	per acre. s. d.	per acre. s. d.
No manure ..	14.6	..	..	..	..
perphosphate					
30 lb./ac. ..	16.8	2.2	11 0	1 9	9 3
60 lb./ac. ..	17.8	3.2	16 0	3 6	12 6
90 lb./ac. ..	18.5	3.9	19 6	5 3	14 3
120 lb./ac. ..	18.7	4.1	20 6	7 0	13 6

It will also be seen that the greatest extra return has been given by the application of the first 30 lb. per acre, and that each successive 30 lb. increase gives a lower extra return. Therefore, when manure is in short supply, it is better to sow all the crop with some manure—whatever amount can be obtained—than to sow some at, say 90 lb. per acre and the remainder without manure.

Wheat manurial trials are conducted on farmers' properties where country plots have been established. The results in the southern part of the Mallee tell the same story as at Walpeup. At some centres during the

past few seasons, yields have been low and thus increases due to superphosphate are not great, but it appears that, for the southern Mallee, a dressing of approximately 90 lb. per acre gives the highest net return.

In the Millewa, at Werrimull, the experiment was designed to provide information as the response obtained from superphosphate both on the "flats" and "sandy rises". Over the period of the test, the sandy rises have shown a greater response to superphosphate than have the flats. This feature, however, has not been consistent in each year—in years of good rainfall better responses are obtained on the flats. Results given for Werrimull are for the averages of the flats and rises. The response to superphosphate in the Millewa is generally not as marked as in the central and southern Mallee, and a dressing of 30 lb. per acre is recommended for the former area.

In addition to the manurial trials on fallow land, tests with superphosphate were conducted on stubble land at Walpeup for the years 1937–40. These results confirmed the information obtained from the Oat Manurial Trial on stubble and showed that when the previous crop was adequately manured, the crop does not respond to heavy dressings of superphosphate. Applications of approximately 30 lb. per acre appear to be all that is warranted.

TABLE 8.—WHEAT MANURIAL TRIALS AT MALLEE CENTRES.
(Yields in bushels per acre.)

Treatment.	Walpeup.	Rainbow.	Swan Hill.	Woomelang.	Ultima.	Berri-willock.	Manangatang.	Murrayville.	Werrimull.
	Average 23 Years, 1925–47.	Average 10 Years, 1927–36.	Average 7 Years, 1933–39.	Average 8 Years, 1940–47.	Average 7 Years, 1940–41, 1943–47.	Average 5 Years, 1943–47.	Average 2 Years, 1946–47.	One Year only, 1947.	Average 10 Years, 1932–41.
No manure	14.6	14.1	18.3	10.9	8.2	11.1	15.4	21.3	15.2
Superphosphate—									
30 lb./ac.	16.8	..	20.3	11.7	8.7	12.6	16.8	20.8	16.0
60 lb./ac.	17.8	15.3	20.8	12.5	9.0	12.4	19.1	24.2	16.2
90 lb./ac.	18.5	..	21.7	12.7	9.4	12.4	18.4	22.2	16.8
120 lb./ac.	18.7	17.1	21.6	12.8	9.5	..	17.2	23.2	17.3

TABLE 9.—WHEAT MANURIAL TRIAL,
STUBBLE GROUND.

(Average of 4 years, 1937-40.)

Treatment.				Yield.
				bus./ac.
No manure ..	..	..	..	9.7
Superphosphate—				
30 lb. per acre ..	..	..	..	10.4
60 lb. per acre ..	..	..	..	10.6
90 lb. per acre ..	..	..	..	10.6

Minor Element Manurial Trial

Recent emphasis on the fact that optimum plant growth is produced only where there is present in the soil, in addition to the more commonly recognized essentials, small amounts of certain minerals other than phosphate, nitrate, or potash, has greatly widened the scope of manurial trials. These minor elements are needed only in small amounts, and, in most soils, they are usually present in sufficient quantities to meet the plants requirements. Responses to minor elements have usually been limited to certain soil types or where regular cropping may have caused mineral depletion.

Recent work has shown that there are a number of areas in Australia where responses have been obtained to one or another of these minor elements—the response in wheat to applications of zinc sulphate in the Wimmera being one such case.

To investigate the question, a “minor element” manurial trial was commenced in 1938. A series of plots was sown on fallow land with a basal dressing of 90 lb. of superphosphate per acre, and, in addition, requisite amounts of various minerals were added when certain plots were sown. The experiment was repeated in 1939 with slight modifications in the rate of application of some of the minerals, and similar treatments were given in an oats-hay trial. In 1940, the trial was located on a soil type with a high lime content, but was confined to rows. The minerals added to the superphosphate, together with the rates per acre at which they were applied, were as follows :—

Zinc sulphate, 20 lb. per acre; magnesium sulphate, 56 lb./ac.; borax, 5 lb./ac.; copper sulphate,

15 lb./ac.; iron sulphate, 56 lb./ac.; manganese sulphate, 30 lb./ac.; and potassium sulphate, 90 lb./ac.

These trials, during the three years, showed that there was no significant improvement in yield due to the addition of these minerals, and the trial was discontinued. It is pointed out that care should be exercised in the use of some minor elements as their indiscriminate application may prove detrimental either to the crop (e.g., due to low germination) or to the soil to which they are applied.

In 1939 and 1940, strips in a crop on a limestone soil at Underbool were top-dressed with the same range of minor elements as were used at Walpeup, but, here again, no significant increase in yield was obtained.

Time of Sowing

In the Mallee, experience has proved that highest yields are usually obtained by sowing early, provided that the land is reasonably free from weeds. In wet seasons with a dry spring, late-sown crops seldom yield equal to those sown early, but, in some years, late spring rains benefit late-sown crops to a greater degree than those sown early.

In addition to the “time of sowing trial”, the results of which are given in Table 10, other trials, which include the time of sowing factor (Tables 5, 11, and 12), all demonstrate the higher yields obtained from early sowing at Walpeup.

TABLE 10.—TIME OF SOWING TRIAL.
(Average results of 10 years, 1932-41.
Variety, Rance 4H.)

Time of Sowing.				Average Yield.
				bus./ac.
Early (3rd week in April)	..	..	..	28.8
Mid-season (mid-May)	..	..	..	26.4
Late (2nd week in June)	..	..	..	22.8

During the period 1937-41, the time of sowing trial included three varieties sown at twelve-day intervals throughout the seeding period. The varieties were Rance 4H (early maturing), Ghurka (mid-season), and Sepoy (late maturing). Results from this trial



A corner of the stable yard at the Mallee Research Station.

again confirmed the superiority of early sowing, and also showed the importance of the incidence of the spring rainfall in relation to the time of heading and flowering of wheat in determining the yield of the crop.

Early sown crops germinate more readily while the ground is still warm, and make quick growth in the more favourable growing conditions. This is of particular importance on the sandier areas, as, by covering the ground more quickly, the early sown crop is better able to withstand sand blasting than a later sown crop.

The weed problem is a factor which plays a big part in determining the time of sowing. Dry sowing does not allow for a kill of mustard or wild turnip, and a crop sown under such conditions may suffer serious competition from these weeds, particularly during a dry spell in the spring.

Wild turnip growth can be particularly vigorous, and, unless a kill is obtained, serious inconvenience may be experienced at harvest. Therefore, one is compelled to wait for a rain to get a germination of the seeds of this weed. Another factor that delays sowing is the presence of hard, wind-blown patches which cannot be broken up until after rain. Experience suggests that, in those years when little autumn rain falls, it may be advisable to delay sowing until after the

break (depending on the particular conditions on the farm); but, when an autumn break is received, sowings in the Mallee should be commenced as early as possible after the middle of April.

Rate of Seeding Trials

Variation in the rate of seeding of a wheat crop for grain has resulted in only small differences in the final yield. During the period 1933-37, a rate of seeding trial, designed to compare various seeding rates

between $\frac{1}{2}$ bushel and $1\frac{1}{4}$ bushels per acre, was conducted. As in other major trials, the plots were sown at the three periods—early, mid-season, and late. The average results of the trial are shown in Table 11.

TABLE 11.—RATE OF SEEDING TRIAL.
(Average 5 years, 1933-37.)

Rate of Seeding.	Early.	Mid-season.	Late.
	bus./ac.	bus./ac.	bus./ac.
30 lb. wheat per acre ..	30.6	26.0	26.0
45 lb. wheat per acre ..	31.7	25.8	26.2
60 lb. wheat per acre ..	31.4	25.8	25.6
75 lb. wheat per acre ..	31.3	25.1	25.6

During these years, variation in rate of seeding at each time of sowing did not have any marked effect on the yields obtained. These tests, however, were conducted on land comparatively free from weed growth.

During the first four years of this test, the variety sown was Ranee 4H, while Ghurka was used in 1937. It is generally accepted that, as seeding progresses, the seeding rate should be increased, but the above results indicate that there is little to be gained by sowing more than 45 lb. per acre on relatively clean land under Mallee conditions.

This was again confirmed in 1939 and 1940, when the trial included three varieties of wheat (Ranee 4H, Ghurka, and Regalia), each sown at 20, 40, and 60 lb. of seed per acre, and at three times of sowing, Table 12 shows the average yields obtained from the three varieties.

TABLE 12.—RATE AND TIME OF SOWING TRIAL.

(Average yield, three varieties, 1939–40.)

Treatment.	Sown Early.	Sown Mid-season.	Sown Late.
	bus./ac.	bus./ac.	bus./ac.
Seed 20 lb. per acre ..	22.6	18.4	12.8
Seed 40 lb. per acre ..	23.0	18.5	13.7
Seed 60 lb. per acre ..	22.6	18.3	13.0

Although the optimum seeding rates may be governed to some extent by the variety of wheat grown, none of the varieties included in the above trial has shown any significant variation in yield due to rate of seeding within the limits of 20 lb. to 60 lb. per acre.

During these three years, experiments indicated that the response to superphosphate was not significantly affected by the rate of seeding of the crop.

Heavier sowing may be justified on land liable to drift severely, or where competition from weeds is to be expected, that is, in cases where it is desired to get a good ground cover as quickly as possible.

TABLE 13.—RATE OF SEEDING TRIAL.
SOWN MID-SEASON.

(Average three years, 1938–40. Bushels per acre.)

Rate of Seeding.	Regalia.	Ranee 4H.	Ghurka.
	bus./ac.	bus./ac.	bus./ac.
Seed 20 lb. per acre ..	21.3	19.7	19.1
Seed 40 lb. per acre ..	21.4	20.0	19.2
Seed 60 lb. per acre ..	21.6	19.9	18.0

WHEAT DISEASES

Flag smut (*Urocystis tritici*).—Wheat varieties differ in their degree of susceptibility to flag smut, and the best means of controlling this disease lies in the use of varieties which are resistant. Losses have been greatly reduced in recent years by the widespread sowing of the resistant varieties, Ghurka, Pindar, and Bencubbin.

Infection of the young growing plant takes place from spores or seeds of the disease present in the soil and to a lesser extent, from seed-borne spores. For this reason, it is impossible to control the disease by pickling the seed. Experimental work in 1932 and 1933 showed that yields of susceptible varieties could be reduced by 75 per cent. through a heavy infection of flag smut.

Results of flag smut investigations have shown that the burning of infected stubbles, fallowing, the rotation of crops, and adequate manuring with superphosphate all tend to reduce the losses caused by the disease on susceptible varieties. Grazing off a young crop increases the severity of the disease, while early sown crops are more liable to serious infection, as the soil and temperature conditions are then more favorable for the germination of the spores. If sowing is delayed, most of the spores will germinate before the crop is sown, and, in the absence of a host plant to infect, the germinated spores will die.

The experiments have also shown that infection of a susceptible variety of wheat is governed to a large extent by the balance of minerals in the soil. A deficiency or an excess of calcium (lime) within the plant results in a reduction of the development of

the disease, while a phosphorus deficiency increases the degree of infection. Application of superphosphate and of ammonium sulphate each assists in reducing the incidence of the disease. The former manure increases the amount of phosphoric acid available to the plant, while the latter has an indirect action on the absorption of calcium. The calcium (lime) content of most Mallee soils is at a level favorable to the development of flag smut, and this, coupled with the fact that these soils are naturally low in phosphates, is probably one of the reasons why crops of susceptible varieties show a greater infestation with flag smut in the Mallee than in most other parts of the State.

Degree of Resistance to Flag Smut

The most important means of control is by the use of resistant varieties. The following table indicates the degree of resistance to flag smut possessed by the commoner wheat varieties :—

Very susceptible—

Baldmin	Free Gallipoli
Federation	Magnet
Regalia	Mogul

Susceptible—

Ranee 4H	Rajah
Bobin	Sepoy

Moderately resistant—

Gabo	Currawa
Gular	Diadem
Ford	Insignia

Resistant—

Dundee	Javelin
Ghurka	Pinnacle
Quadrat	Bencubbin
Pindar	Koorda
Nabawa	Warigo

All new crossbred wheats sown in all yield trials in the State are tested for flag smut resistance at Walpeup. In this way, the reaction of a new variety to the disease has been ascertained before it is released to farmers. All the wheat varieties released by the Department since 1940 have at least moderate resistance to the disease.



Inheritance of Resistance to Flag Smut in Wheat.

Row 1—Resistant; Rows 2 and 3—Susceptible to disease. The three selections are the progeny of a mating between Nabawa (resistant) and Indian H (susceptible).

Ball smut, stinking smut, or Bunt (*Tilletia tritici* or *T. levis*). Ball smut was for many years the most troublesome and destructive disease of wheat in Victoria. The development of pickling techniques, first the wet pickling with bluestone or formalin and later the dry pickling with copper or mercury compounds, have proved a satisfactory control, provided the pickling is done thoroughly.

At this station, the trials with ball smut have been concerned with the efficacy of various dry pickling powders in preventing ball smut, and also to determine the effect of the more common pickling powders on the germination and yield of wheat when clean seed is pickled. In regard to the latter aspect, the results have failed to show any significant differences in yield due to the pickling treatment.

In the trial designed to compare the effectiveness of the various brands and types of dry pickling compounds in controlling ball smut, various copper and mercury compounds marketed under proprietary trade names have been investigated. The method of testing was to sow small drill plots, the seed of each plot having been artificially infected with ball smut spores before pickling. Counts of the infected plants were made before harvest, in order to determine the percentage of disease in the crop. The trial indicated that most of the copper compounds now on the market are satisfactory in



Visitors inspecting plots on Field Day, 1947.

controlling bunt. There are substantial differences between some of the mercury compounds, but the better brands are more effective than the copper fungicides. Seed pickled with a mercury compound runs more freely in the drill, but a certain amount of care is necessary when using it as it is very poisonous and can cause nasty sores on the hands. The fact that a smaller amount per bushel is required offsets to some extent the higher cost of the compound.

The most important factor in using any dry pickling compound is to ensure that the pickle is thoroughly dusted on the seed, so that every seed gets a coating of the pickle. From $1\frac{1}{2}$ to 2 oz. of pickle per bushel of seed is necessary. There is often a tendency to try to do the pickling too quickly, with the result that all grains are not thoroughly dusted—and in these cases, such grains are not protected against the disease.

Loose smut (Ustilago tritici).—In this disease the seed head of the wheat plant at flowering time is replaced by a loose black mass of spores. When these spores blow away—to infect other plants—only the bare “back-bone” of the head is left. The control of loose smut is much more difficult than ball smut, because the spores of the disease enter at flowering time and are

enclosed within the grain, and, therefore, cannot be reached by pickling powders.

A method of control is to use a hot-water treatment to kill the spores within the grain, but the temperatures must be regulated so that the wheat grain is not affected. Modifications of this treatment, using the heat of the sun, have proved satisfactory when high temperatures are experienced. Four hours soaking in water in a tray in the sun, when the temperature exceeds 100° F., then drying the soaked wheat has proved a satisfactory control. As the seed is thoroughly dried after soaking it can be stored and presents no difficulties at seeding time.

Efforts are also being made by cross-breeding to procure varieties that are resistant to the disease. The most practicable precaution farmers can take is to obtain their seed from crops as free as possible from the disease.

Root Diseases of Cereals

Various organisms causing root rot in cereals have been recorded at the Mallee Research Station. The number of species that cause these diseases makes experimental work on their control particularly complex—as several species may be present in the one plant.

The following are some of the organisms which have been identified at the Station :—

WHEAT—*Ophiobolus graminis* (take-all),
Fusarium culmorum, *Helminthosporium* spp, *Curvularia ramosa*,
Wojnowicia graminis.

OATS—*Curvularia ramosa*, *Rhizoctonia solani* (purple patch), *Fusarium* spp.,
Stemphylium lanuginosum.

BARLEY—*Helminthosporium* spp., *Fusarium* spp., *Curvularia* spp.

Observations made at the Station suggest that these diseases are more destructive

where the soil preparation is least efficient. It has been observed that greatest infection occurred in the non-fallow plots, lighter infections in the late fallows and fallows which were sheeped only, while practically none was apparent in well-cultivated fallows. The "no manure" plots of the Manurial Trial also showed a greater degree of infection than the plots which received superphosphate.

Experimental work at other places shows that crops are more susceptible to these diseases when the soil is over-cropped or fertility is depleted.

Burnley Egg-Laying Competition

Monthly Progress Totals

The number of first-grade eggs laid to 14th August, 1948, by the leading fowls in each class of the Burnley Egg-laying Competition, together with the names of the birds' owners, are set out in the following tables. The tests, which are being conducted at the School of Primary Agriculture and Horticulture, Swan-street, Burnley, commenced on 1st April, 1948, and will conclude on 2nd March, 1949, a period of 336 days. First-grade eggs, during the first two months of the competition, must weigh not less than 1 $\frac{3}{4}$ oz. and not less than 2 oz. thereafter.

Pen No.	Competitor.	Total First Grade Eggs.	Pen No.	Competitor.	Total First Grade Eggs.
Class 1.—White Leghorns—Wet Mash.			Class 4.—Australorps—Wet Mash.		
146	Goddard and Harvey	123	35	Paton, W. S.	123
147	Hill, H. E.	120	31	Hanson, S. H.	118
142	Gibb's Highway Stud	114	15	Davis, E. C.	114
128	Abikhair, Les	110	4	Beswick, A. G.	113
171	Meluish, J. E. G.	107	7	Caspar, A. and L.	111
130	Baberton, H.	106	16	Davis, E. C.	110
160	Lowe, G. R.	106			
Class 2.—White Leghorns—Dry Mash.			Class 5.—Rhode Island Reds—Wet Mash.		
205	Clements, W. H.	114	76	Fraser, D. R.	107
230	Moran, G.	111	80	Grenville Stud Poultry Farm	103
235	Skinner, A. A.	111	98	Wear, J.	105
229	Moran, G.	109	71	Cropley, H. J.	95
231	Roberts, Miss A. E. C.	100	90	Mills, J. J.	95
208	Durkin, M.	99	63	"Seven Acres" Poultry Farm	94
215	French, R. E.	99			
216	French, R. E.	99			
Class 3.—Light Breeds, other than White Leghorns—Wet Mash.			Class 5.—All Heavy Breeds, other than Rhode Island Reds and Australorps—Wet Mash.		
116	Kemp, H. L. (Legbars)	98	54	Cocking, W. (Light Sussex)	80
126	Woollett, C. J. (Legbars)	96	58	Lang, J. (Langshan)	76
105	Doull, J. (Legbars)	93	56	Wilkinson Bros. (Light Sussex)	55
104	Chalmers, H. L. (Legbars)	88	57	Lang, J. (Langshan)	54
115	Kemp, H. L. (Legbars)	84			
123	Wooller, J. (Ancona)	83			

STANDARD HERD TEST REPORT (continued from page 392).

Cows Exceeding 500 lb. of Butterfat—1947-1948

Class.	800 to 900	700 to 800	600 to 700	500 to 600	Total.
Mature ..	1	5	30	123	159
Senior 4 ..	..	..	3	33	36
Junior 4 ..	..	..	3	32	35
Senior 3 ..	..	2	2	26	30
Junior 3 ..	..	1	3	25	29
Senior 2 ..	..	..	1	10	11
Junior 2 ..	..	..	..	10	10
Grand Totals ..	1	8	42	259	310
1946-47 Totals	1	12	40	237	290

Averages 1947-1948 (273 Days' Lactation Period.)

Class.	Number in Class.	Average Butterfat 273 Days (Without Allowances).	Average Butterfat 273 Days (With Allowances).
		lb.	lb.
Junior 2 ..	1,268	295	415
Senior 2 ..	511	318	418
Junior 3 ..	491	341	421
Senior 3 ..	387	357	417
Junior 4 ..	369	365	405
Senior 4 ..	298	376	396
Mature ..	1,651	375	..
Total ..	4,975	..	..

Average all classes without allowances = 343 lb. butterfat.

Average all classes with allowances = 401 lb. butterfat.

Table Showing Comparison between Double and Composite Sample Systems—Standard Herd Test

DETAILS OF 30-DAY SUB-PERIOD FOR EACH METHOD.

Breed.	Number of Cows.	Double Sample System.		Composite Sample System.	
		Total Butterfat.	Average Butterfat.	Total Butterfat.	Average Butterfat per Cow.
					lb. B.F.
Jersey ..	37	1,564.6	42.3	1,572.0	42.5
Dairy Shorthorn ..	35	1,238.2	35.4	1,230.6	35.2
Ayrshire ..	13	418.6	32.2	424.1	32.6
Guernsey ..	11	393.1	35.7	390.2	35.5
Friesian ..	9	368.1	40.9	366.4	40.7
A.I.S. ..	8	158.3	19.8	156.7	19.6
Red Poll ..	4	152.2	38.1	154.7	38.7
Total ..	117	4,293.1	..	4,294.7	..

Average per cow for 30-day sub-period

36.69 lb.

36.70 lb.

The Six Leading Cows in Each Section, 1947-1948

Name of Cow.	Owner.	Class and Breed.	Butterfat.
Mature.			
Yarraview Le Mode	Payne, A. E. T.	Guernsey ..	821·4
Victoria Belle	Department of Agriculture	Friesian ..	774·6
Yarraview Carol	Payne, A. E. T.	Guernsey ..	768·9
Yarraview Siren	Payne, A. E. T.	Guernsey ..	731·2
Surrey Starette 10th	Stedman, J.	Jersey ..	715·0
Victoria Olga	Department of Agriculture	Friesian ..	705·3
Senior four-year-old.			
Bamawm Lassie Belle 2nd	Williams, L.	Jersey ..	652·5
Lynbrae Waterlily 3rd	Peck, R. A.	Jersey ..	623·8
Jindivick Babs 2nd	Ronalds, O., and Son	Jersey ..	620·6
Lumeah Veronica May	Withall, H. L.	Jersey ..	597·8
Lauriston Satisfaction 2nd	Gardener Bros.	Jersey ..	595·7
Fairview Alton Segis	Polmear, G.	Friesian ..	595·3
Junior four-year-old.			
Lumeah Magnify	Charlton, G. F.	Jersey ..	644·2
Windrest Chevy's Bell	Haywood, Dr. A. R.	Jersey ..	641·6
Wattle Vale Treasure Girl	Dowel, A. E.	Jersey ..	606·7
Surrey Boronia 27th	Stedman, J.	Jersey ..	592·0
Verbank Marie's Empress	Lineham, P. W.	Jersey ..	585·5
Wolrah Tangerine 2nd	Ware, F. E., and H. H.	Jersey ..	582·3
Senior three-year-old.			
Olive Dale Dove	Goddard, J. H.	Ayrshire ..	763·1
Elm Grove Songstress 5th	Gay, W. C. R.	Jersey ..	747·8
Devon Park Victorious Madeira 2nd	Devon Park Stud Farm	Jersey ..	646·8
Elm Grove Linda 16th	Lineham, P. W.	Jersey ..	631·2
Edenhope Gilder Rose 2nd	Bennett, R. H., and Sons	Jersey ..	592·0
Leura Annette 21st	Axford, Estate of the late W. H.	Jersey ..	583·8
Junior three-year-old.			
Yarraview Golden Daffodil	Payne, A. E. T.	Guernsey ..	728·1
Elm Grove Songstress 6th	Lineham, P. W.	Jersey ..	662·2
Windrest Nobles Charm 2nd	Haywood, Dr. A. R.	Jersey ..	621·9
Lumeah Sister	Charlton, G. F.	Jersey ..	612·1
Mornmoot Princess Madeira 37th	Young, N. H.	Jersey ..	592·3
Windrest Rosemary	Haywood, Dr. A. R.	Jersey ..	585·4
Senior two-year-old.			
Lumeah Soprano	Charlton, G. F.	Jersey ..	607·1
Surrey Starette 15th	Stedman, J.	Jersey ..	560·7
Verbank Daphne	Lineham, P. W.	Jersey ..	559·3
Inverurie Flirt	Goddard, J. H.	Ayrshire ..	557·3
Windrest Chevy's Chic	Haywood, Dr. A. R.	Jersey ..	533·7
Coodardy Lady Twylish	Clark, P. W., and Son	Jersey ..	527·6
Junior two-year-old.			
Milksham Daisy 51st	Carson, Mrs. W.	Jersey ..	566·8
Surrey Lady Doreen 24th	Stedman, J.	Jersey ..	558·3
Surrey Boronia 31st	Stedman, J.	Jersey ..	539·2
Mornmoot Northwood Madeira 22nd	Young, N. H.	Jersey ..	518·8
Mornmoot Mimi 11th	Young, N. H.	Jersey ..	515·3
Mornmoot Princess Madeira 41st	Young, N. H.	Jersey ..	514·6

List of Cows Producing 600 lb. Butterfat or Over, 1947-1948

Name of Cow.	Owner.	Class.	Breed.	Butterfat. lb.
Yarraview Le Mode	Payne, A. E. T.	Mature ..	Guernsey ..	821.4
Victoria Belle	Department of Agriculture ..	Mature ..	Friesian ..	774.6
Yarraview Carol	Payne, A. E. T.	Mature ..	Guernsey ..	768.9
Olive Dale Dove	Goddard, J. H.	Senior 3 ..	Ayrshire ..	763.1
Elm Grove Songstress 5th ..	Gay, W. C. R.	Senior 3 ..	Jersey ..	747.8
Yarraview Siren	Payne, A. E. T.	Mature ..	Guernsey ..	731.2
Yarraview Golden Daffodil ..	Payne, A. E. T.	Junior 3 ..	Guernsey ..	728.1
Surrey Starette 10th	Stedman, J.	Mature ..	Jersey ..	715.0
Victoria Olga	Department of Agriculture ..	Mature ..	Friesian ..	705.3
Inverbroom Air Marie	Wade, G. F.	Mature ..	Jersey ..	684.2
Glenoak Popular Melody	Scott, C. W.	Mature ..	Guernsey ..	684.1
Yarraview Ruby	Payne, A. E. T.	Mature ..	Guernsey ..	678.8
Willow Park Duchess 35th ..	Atkinson, Estate of the late W. K.	Mature ..	Dairy Short-horn	675.5
Lumeah Marie	Charlton, G. F.	Mature ..	Jersey ..	667.7
Yarraview Chamois	Payne, A. E. T.	Mature ..	Guernsey ..	664.6
Elm Grove Songstress 6th ..	Lineham, P. W.	Junior 3 ..	Jersey ..	662.2
Victoria Jostle	Department of Agriculture ..	Mature ..	Friesian ..	658.5
Yarraview de Luxe	Payne, A. E. T.	Mature ..	Guernsey ..	656.6
Barnawm Lassie Belle 2nd ..	Williams, L.	Senior 4 ..	Jersey ..	652.5
Windrest Chevy's Beauty ..	Haywood, Dr. A. R. ..	Mature ..	Jersey ..	651.0
Yarraview Heritage	Payne, A. E. T.	Mature ..	Guernsey ..	650.8
Devon Park Victorious Madeira 2nd	Devon Park Stud Farm ..	Senior 3 ..	Jersey ..	646.8
Inverell Consent 6th	Dowel, H. H.	Mature ..	Jersey ..	646.8
Lumeah Magnify	Charlton, G. E.	Junior 4 ..	Jersey ..	644.2
Surrey Bonnie Madeira 11th ..	Stedman, J.	Mature ..	Jersey ..	642.7
Windrest Chevy's Bell	Haywood, Dr. A. R. ..	Junior 4 ..	Jersey ..	641.6
Bangalow Vale Carmine	Scott, C. W.	Mature ..	Guernsey ..	641.3
Deloraine Rosa	Broad, W. A.	Mature ..	Jersey ..	637.3
Verbank Silver Madeira	Lineham, P. W.	Mature ..	Jersey ..	637.2
Ismalia Garenne 5th	Murdoch, J., and Son ..	Mature ..	Jersey ..	632.7
Elm Grove Linda 16th	Lineham, P. W.	Senior 3 ..	Jersey ..	631.2
Glenoak Lotty	Scott, C. W.	Mature ..	Guernsey ..	631.2
Victoria Josling	Department of Agriculture ..	Mature ..	Friesian ..	631.0
Yarraview Teeny	Payne, A. E. T.	Mature ..	Guernsey ..	631.0
Balnel G. C. Duchess	Askew, Mrs. S. R.	Mature ..	Jersey ..	625.2
Sunny Dell Lady Starbright ..	Lind, A. E., and Sons ..	Mature ..	Jersey ..	624.2
Lynbrae Waterlily 3rd	Peck, R. A.	Senior 4 ..	Jersey ..	623.8
Windrest Nobles Charm 2nd ..	Haywood, Dr. A. R. ..	Junior 3 ..	Jersey ..	621.9
Jindivick Babs 2nd	Ronalds, O., and Son ..	Senior 4 ..	Jersey ..	620.6
Windrest Island Star 2nd ..	Haywood, Dr. A. R. ..	Mature ..	Jersey ..	619.0
Lumeah Sister	Charlton, G. F.	Junior 3 ..	Jersey ..	612.1
Windrest Rose Bay's Dainty ..	Haywood, Dr. A. R. ..	Mature ..	Jersey ..	612.1
Green Glen Tiddlewinks	Felmingham, L. J. ..	Mature ..	Jersey ..	611.7
Selsey Melvina	Nicholas, M. A.	Mature ..	Jersey ..	611.5
Elm Grove Laurette 5th	Gay, W. C. R.	Mature ..	Jersey ..	608.4
Karrara Fancy Madeira	Devon Park Stud Farm ..	Mature ..	Jersey ..	607.8
Lumeah Soprano	Charlton, G. F.	Senior 2 ..	Jersey ..	607.1
Shenstone Primula 4th	Emmett, Mrs. S., and Sons ..	Mature ..	Jersey ..	607.0
Wattle Vale Treasure Girl ..	Dowel, A. E.	Junior 4 ..	Jersey ..	603.7
Vaocluse Empress 9th	Fairchild and Clutterbuck ..	Mature ..	Jersey ..	604.6
Belgonia Peggy 29th	Maloney, P. J.	Mature ..	Jersey ..	604.1

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HERD AVERAGES, 1947-1948

Owner.	Breed.	Junior 2-year-old.		Senior 2-year-old.		Junior 3-year-old.		Senior 3-year-old.		Junior 4-year-old.		Senior 4-year-old.		Mature.		Total Herd.	Average Butter- fat without Allow- ances.	Average Butter- fat with Allow- ances.
		No.	Average Butter- fat.	No.	Average Butter- fat.	No.	Average Butter- fat.	No.	Average Butter- fat.	No.	Average Butter- fat.	No.	Average Butter- fat.	No.	Average Butter- fat.			
		lb.		lb.		lb.		lb.		lb.		lb.		lb.				

Herds of 25 Cows and Over

1. Stedman, J.	Jersey	8	455.7	3	522.4	7	522.5	2	520.9	8	503.8	—	—	8	562.1	36	512.2	585.5
2. Young, N. H.	"	16	419.1	3	479.6	7	498.2	2	544.6	2	482.1	—	—	5	552.5	35	469.9	565.1
3. Lincham, P. W.	"	14	394.0	5	440.7	5	511.5	4	477.7	4	478.7	3	521.0	11	470.9	46	454.5	536.0
4. Payne, A. E. T.	Guernsey	5	326.1	1	332.8	6	470.2	—	—	2	479.1	1	233.6	16	503.4	31	485.2	534.5
5. Haywood, Dr. A. R.	Jersey	15	372.8	3	369.5	8	438.8	6	424.6	4	528.5	1	431.6	18	514.3	55	446.6	526.2
6. Maloney, P. J.	"	8	325.4	2	334.8	3	465.4	3	498.4	4	518.6	1	541.2	12	473.9	33	433.4	500.7
7. Polmear, G.	Friesian	6	308.3	2	438.8	3	398.4	5	451.7	2	403.5	7	493.6	7	468.9	32	423.9	489.9
8. Bennett, J. W.	Jersey	15	351.8	3	440.5	7	396.2	4	437.8	3	429.3	2	454.8	8	449.2	42	402.7	489.1
9. Fairchild and Clutterbuck	"	6	357.0	3	416.1	6	399.4	1	477.2	7	417.7	3	402.2	10	490.7	36	425.2	488.5
10. Till, J. A.	"	8	347.8	2	469.9	1	293.8	4	408.6	3	514.9	4	406.4	6	468.8	26	416.0	481.5
11. Jackson, H.	"	11	336.0	5	374.6	—	—	5	428.4	—	—	2	465.4	5	484.8	28	395.2	478.8
12. Chester, E. N.	"	5	339.0	3	309.4	5	386.4	1	446.9	2	405.8	4	480.7	11	463.8	31	414.1	471.2
13. Gardener Bros.	"	9	390.1	2	350.3	—	—	4	433.3	2	402.1	4	487.9	12	454.1	33	404.2	464.1
14. Keele, H. A.	"	10	323.2	8	364.2	1	339.7	1	422.8	3	433.2	—	—	7	457.4	30	330.3	463.2
15. Clark, P. W., and Son	"	4	321.4	6	440.1	6	391.1	1	365.4	—	—	—	—	13	411.4	30	400.0	461.1
16. Harvey, Hon. T.	"	13	341.2	1	486.7	1	416.7	1	400.0	2	403.4	—	—	13	430.7	31	391.8	460.4
17. Read, Estate of the late J. D.	"	7	353.2	—	—	3	397.9	2	412.9	4	414.2	—	—	12	430.6	28	404.2	459.2
18. Clarke, F. W.	"	11	305.3	4	364.6	7	374.1	3	444.7	1	423.8	1	401.0	4	455.7	31	368.3	457.6
19. Devon Park Stud Farm	"	9	307.0	3	345.4	3	310.3	3	407.1	4	396.5	—	—	4	486.1	26	376.1	457.0
20. Broad, R. C.	"	17	330.5	4	401.2	1	310.9	4	455.2	3	407.7	1	311.9	13	401.6	43	374.7	456.1
21. Dowel, H. H.	"	7	328.7	1	313.7	2	424.5	5	411.0	1	423.0	3	398.1	13	407.0	32	388.3	443.7
22. McNabb, G. A., and Son	"	13	309.5	—	—	6	372.7	3	420.5	4	354.2	5	417.8	12	391.7	43	366.4	438.1
23. Cox, A., and Sons	"	7	310.9	5	379.0	13	345.7	3	341.7	5	371.7	1	464.0	16	395.8	50	364.9	438.0
24. McFarland, R. A.	"	8	321.3	1	419.3	2	386.3	1	406.9	—	—	3	396.7	12	408.9	27	380.2	438.0
25. Trevas, E. T.	"	11	316.1	3	401.5	3	347.0	1	455.1	1	332.0	1	374.1	6	386.5	26	353.9	435.6
26. Broad, Mrs. A. A.	"	11	309.2	1	150.0	3	401.0	1	406.9	1	319.1	—	—	11	392.8	30	364.8	435.0
27. Peck, R. A.	"	7	343.3	1	361.1	4	387.5	—	—	2	337.1	3	393.5	11	395.1	23	375.6	432.1
28. McKenzie, A. E.	"	8	254.7	4	323.7	1	337.3	3	399.0	2	420.7	—	—	7	415.6	25	358.3	430.5
29. Carson, Mrs. W.	"	14	321.0	4	353.3	1	383.5	1	400.7	6	351.7	—	—	10	385.8	37	351.3	430.4
30. Beattie, W. P.	"	7	300.6	5	356.1	3	346.5	1	344.2	2	165.7	1	291.9	8	395.1	30	356.2	427.7
31. Vaughan Bros.	"	16	296.4	3	331.7	1	277.1	2	349.6	—	—	4	402.5	5	422.7	31	336.7	425.3
32. Baugh, A. S.	"	8	324.5	3	299.7	4	326.1	2	259.4	3	421.1	—	—	5	411.6	25	345.6	423.4
33. Department of Agriculture	Red Poll	14	283.5	7	289.9	2	269.6	2	445.4	4	377.7	11	358.1	31	380.7	71	347.6	418.4
34. Tomasetti, B. G.	Ayrshire	13	301.6	2	297.4	8	338.6	3	414.6	2	290.1	1	349.4	9	344.1	38	328.8	410.8
35. Colenso, L. W. R.	Jersey	3	309.1	4	310.7	1	348.1	1	273.1	2	431.1	2	335.4	14	395.0	27	365.0	408.8
36. Jakobi, L. W.	"	8	277.2	1	333.8	—	—	1	442.5	1	405.0	3	384.7	14	387.8	23	356.5	406.6
37. Emmett, Mrs. S., and Sons	"	11	281.6	2	175.8	2	345.1	2	434.5	2	317.6	—	—	11	395.0	30	333.0	403.1
38. Anderson, J., and Son	"	5	322.3	2	434.0	1	373.1	1	312.5	—	—	1	401.4	18	365.4	23	362.3	403.0
39. Broad, A. J.	"	13	240.9	1	271.8	7	370.6	1	480.8	1	198.5	1	415.0	10	392.3	34	324.0	402.3
40. Maher, R. H., and Son	"	11	264.4	2	288.1	9	320.5	2	347.9	3	360.7	—	—	16	378.6	43	330.4	402.0
41. Newton, J. M., and Sons	Aus. Illawarra	9	289.5	5	294.8	1	341.0	4	348.0	3	276.0	4	372.6	16	379.6	42	338.2	401.7
42. Syme, D. F.	Shorthorn	8	313.4	2	334.0	1	348.5	2	362.7	2	317.7	—	—	10	358.7	25	338.9	401.5
43. Ballarat phanage	Or Jersey	9	324.9	2	316.4	2	328.8	4	352.9	4	391.6	4	379.1	21	338.0	46	313.6	400.9
44. Boardman, Mrs. E. G.	"	5	320.3	1	385.4	4	356.9	2	330.7	2	343.8	1	408.2	11	350.8	26	347.3	400.5

Herds of 15 to 24 Cows

1. Charlton, G. F.	Jersey	6	433.7	5	515.9	1	612.1	2	486.8	2	574.3	2	545.0	5	505.7	23	501.5	572.5
2. Department of Agriculture	Friesian	2	338.7	1	411.0	1	399.1	1	480.3	2	476.1	1	507.3	12	528.4	20	491.4	522.9
3. Masters, S. H., and Son	Jersey	9	354.4	2	442.5	3	478.1	1	570.0	1	500.2	1	582.9	3	451.0	20	425.8	510.3
4. Phillips, J. H.	"	4	403.7	2	371.1	—	—	3	533.0	1	503.6	1	411.8	4	464.3	15	448.5	509.9
5. Dowel, A. E.	"	5	344.5	4	428.7	1	472.6	—	—	3	512.3	5	492.6	3	400.8	21	442.5	507.4
6. Hurrey, Estate of the late W. H.	"	3	380.7	2	412.9	3	421.7	2	469.8	3	497.4	3	473.4	1	399.3	17	440.2	506.0
7. Scott, A. L.	"	8	367.8	2	354.3	3	340.9	1	572.9	1	505.6	1	459.4	3	475.6	19	402.0	484.0
8. Lind, A. E., and Sons	"	6	372.6	—	—	4	362.6	2	499.0	1	489.1	2	450.1	5	449.1	20	415.9	480.4
9. Gay, W. C. R.	"	5	313.4	2	362.3	—	—	2	611.1	2	441.3	1	459.5	5	454.7	17	419.4	480.4
10. Maloney, C. P.	"	12	356.6	3	429.4	—	—	1	489.5	3	425.4	3	444.0	2	344.3	24	389.7	476.7
11. Fellingham, L. J.	"	3	316.9	1	333.9	2	440.3	1	339.5	2	561.1	3	489.9	8	441.8	20	431.5	475.0

Herd Averages, 1947-1948—continued

Owner.	Breed.	Junior 2-year-old.		Senior 2-year-old.		Junior 3-year-old.		Senior 3-year-old.		Junior 4-year-old.		Senior 4-year-old.		Mature.	Total Herd.	Average Butter- fat without Allow- ances.	Average Butter- fat with Allow- ances.
		No.	Average Butter- fat.	No.	Average Butter- fat.	No.	Average Butter- fat.	No.	Average Butter- fat.	No.	Average Butter- fat.	No.	Average Butter- fat.	No.	Average Butter- fat.		
			lb.		lb.		lb.		lb.		lb.		lb.			lb.	lb.
Herds of 15 to 24 Cows—continued																	
12. Bruhn, C. H. . .	Jersey . .	9	362.4	2	331.4	—	—	3	448.1	1	440.2	2	375.4	7	459.3	24	403.1
13. Bennett, R. H., and Sons . . .	" . .	2	297.9	—	—	4	409.3	4	444.3	5	417.7	3	525.1	5	389.6	23	418.3
14. Carne, W. J. . .	" . .	8	348.6	3	375.8	—	—	1	524.5	2	387.4	1	383.0	2	450.4	17	383.3
15. Nicholas, M. A. .	" . .	5	303.0	2	393.9	1	450.9	—	—	2	303.4	3	450.3	7	502.6	20	411.4
16. Goddard, J. H. .	Ayrshire .	3	289.2	3	406.3	4	358.3	4	450.2	2	485.1	—	—	6	421.5	22	400.9
17. Ross, D. M. . .	Dairy Shorthorn	3	301.6	9	355.4	—	—	1	376.3	1	217.8	1	549.1	7	487.5	22	393.6
18. Askew, Mrs. S. R.	Jersey . .	5	324.6	1	339.2	1	315.0	—	—	—	—	4	492.9	8	438.2	19	408.1
19. Crawford, Mrs. L.	" . .	14	345.0	—	—	1	414.7	1	315.5	2	430.9	1	470.0	3	356.8	22	362.4
20. Barclay, A. H. .	Guernsey .	8	314.3	3	360.4	5	378.8	1	405.5	1	407.7	—	—	4	423.4	22	367.5
21. Handbury, J. E., and Son . . .	Jersey . .	6	319.8	1	304.2	2	483.1	1	399.7	1	546.8	—	—	5	397.0	16	382.5
22. Broad, E. E. . .	" . .	7	363.6	—	—	2	458.0	—	—	1	286.7	—	—	6	391.2	16	381.0
23. Burgman, Jack	Friesian . .	7	303.9	—	—	—	—	3	415.8	—	—	2	422.1	3	458.9	15	373.1
24. Lawton, W. and E. . .	Jersey . .	8	314.9	1	370.5	4	387.8	1	389.2	1	293.7	—	—	1	409.4	16	345.8
25. Burgman, F. A. .	" . .	8	316.1	—	—	—	—	1	430.1	—	—	—	—	13	425.9	22	386.2
26. Wilson, Alan . .	" . .	5	307.7	2	343.8	—	—	1	336.1	3	406.0	—	—	9	433.7	20	384.2
27. Nancarrow Bros.	" . .	6	281.1	3	310.8	1	533.8	2	431.2	1	471.6	—	—	2	394.0	15	351.7
28. Desmond, J. J. .	" . .	6	283.8	—	—	2	399.6	1	418.0	2	471.3	—	—	7	411.3	18	374.5
29. Walker, C. S. . .	" . .	2	328.4	1	325.1	2	391.5	1	382.7	—	—	—	—	13	419.5	19	400.1
30. Waterhouse, H. W., and Son . .	" . .	7	289.3	1	334.0	2	315.2	5	389.6	1	374.0	1	382.4	7	432.0	24	363.2
31. McKenzie, A. S., and Son . . .	" . .	7	308.2	3	371.5	1	356.0	—	—	1	501.1	—	—	7	377.8	19	356.5
32. Waite, H. M. . .	" . .	8	301.2	2	268.2	1	422.8	1	357.2	2	393.6	—	—	3	380.7	17	332.6
33. Jardine, W. R. .	" . .	4	288.5	2	337.6	—	—	3	413.4	2	382.1	1	393.6	5	362.2	17	355.2
34. McKenzie, Mrs. E. J., and Sons	" . .	4	319.1	—	—	2	319.8	—	—	1	439.0	1	423.1	9	382.1	17	365.7
35. Gilmour Bros. . .	" . .	3	323.0	2	360.5	4	370.5	—	—	2	294.2	—	—	5	347.0	16	343.4
36. Bertram, A. E. .	Friesian . .	4	320.9	1	337.0	3	366.5	2	319.9	3	313.1	1	364.2	5	376.9	19	344.6
37. Davidson, A. C. .	Jersey . .	9	271.1	6	274.4	—	—	—	—	—	—	—	—	3	457.5	18	308.3
38. Cowan, G. L. S.	Friesian . .	6	251.3	3	352.6	4	292.2	—	—	1	395.7	3	412.8	3	394.0	20	327.5

Herds of 10 to 14 Cows

1. Ronalds, O., and Son . . .	Jersey . .	—	—	2	384.8	—	—	2	450.7	1	496.1	1	620.6	5	475.4	11	469.5
2. Scott, C. W. . .	Guernsey .	1	473.6	1	418.6	—	—	—	—	—	—	—	—	11	488.5	13	482.0
3. Williams, L. . .	Jersey . .	4	400.3	3	349.9	—	—	—	—	—	—	3	528.1	3	459.9	13	431.9
4. Broad, W. A. . .	" . .	1	292.4	1	415.4	2	434.8	—	—	3	443.8	2	500.4	5	488.3	14	453.6
5. Beggs, G. . . .	" . .	2	231.6	1	386.1	2	500.6	—	—	1	418.2	2	501.3	3	513.8	11	437.5
6. Thompson, H. D. L. . . .	" . .	10	354.8	1	468.9	1	457.7	—	—	1	475.4	—	—	—	—	13	380.8
7. Watts, J. S. . .	" . .	2	350.6	5	410.8	1	434.9	1	435.5	—	—	1	342.5	1	508.2	11	406.9
8. Prince, Mrs. H. A.	" . .	3	365.4	4	424.9	1	436.7	—	—	2	501.3	1	415.4	3	406.0	14	419.2
9. MacLean, F. P. .	" . .	4	368.8	—	—	—	—	—	—	—	—	1	436.2	9	477.8	14	410.8
10. Trewin, J. V. . .	" . .	2	347.1	—	—	1	428.2	3	420.0	—	—	1	454.0	4	460.1	11	425.2
11. Phillips, F. P. .	" . .	6	307.9	—	—	—	—	4	473.1	1	415.2	—	—	—	—	11	377.7
12. Stephens, Dr. F. G. . . .	Guernsey .	1	309.8	1	311.4	3	358.5	—	—	1	478.5	1	425.7	4	476.1	11	409.5
13. Smith, B. A. . .	Friesian . .	—	—	2	313.0	3	398.4	—	—	1	435.7	1	330.0	3	477.7	10	402.0
14. Fixter, A. . . .	Guernsey .	1	306.2	2	348.8	1	438.1	—	—	3	450.8	2	360.8	4	422.4	13	401.8
15. Cox, G. and R. .	Jersey . .	3	318.5	2	398.0	—	—	—	—	2	463.6	1	479.0	4	378.2	12	389.2
16. Goodfellow, P. W.	Friesian . .	1	300.4	5	318.0	—	—	—	—	—	—	1	491.8	3	468.4	10	378.7
17. Hefternan Bros.	Jersey . .	—	—	—	—	3	331.8	1	355.6	2	409.4	1	398.3	5	434.2	12	407.4
18. Clark, J. E. and F. A. . . .	" . .	3	274.7	1	365.6	1	403.7	—	—	4	394.0	2	422.2	1	433.6	12	370.6
19. Fraser, G. A., and Son	Ayrshire .	1	313.3	2	406.3	2	282.7	2	466.8	1	442.9	2	350.5	4	388.2	14	350.1
20. Wiltshire, J. A.	Guernsey .	4	344.0	1	355.6	1	430.9	—	—	—	—	—	—	1	346.0	10	355.2
21. Ware, P. E. and H. H. . . .	Jersey . .	5	281.3	3	301.3	1	311.6	3	346.4	2	477.4	—	—	—	—	14	331.9
22. Ludeman, Leslie C. . . .	" . .	2	311.2	2	344.1	1	377.7	1	422.6	3	382.0	2	339.4	3	391.2	14	365.1
23. Chadderton, J. E.	" . .	5	304.6	1	319.5	—	—	1	353.8	—	—	2	482.1	4	359.2	13	353.6

Class Analysis of Quarterly Standard Herd Test Records, 1947-1948

Quarter Ended.	Breed.	Junior 2.		Senior 2.		Junior 3.		Senior 3.		Junior 4.		Senior 4.		Mature.		Breed Average.	
		No.	Average Butterfat.	No.	Average Butterfat.	No.	Average Butterfat.	No.	Average Butterfat.	No.	Average Butterfat.	No.	Average Butterfat.	No.	Average Butterfat.	No.	Average Butterfat.
			lb.		lb.		lb.		lb.		lb.		lb.		lb.		lb.
September ..	Friesian ..	8	289	4	316	11	310	2	384	3	403	2	463	19	443	49	374
December ..	" ..	12	267	3	294	1	302	2	320	5	357	3	361	7	363	33	316
March ..	" ..	9	298	5	301	3	353	4	406	3	291	10	439	11	442	45	378
June ..	" ..	18	296	8	351	5	395	10	406	4	378	7	403	18	473	70	386
Total ..	..	47	287	20	323	20	337	18	394	15	359	22	420	55	443	197	369
September ..	Guernsey	12	309	5	364	10	363	2	363	8	371	1	426	22	385	60	355
December ..	" ..	6	321	3	400	5	336	3	317	2	337	2	382	10	530	31	403
March ..	" ..	4	334	4	323	3	465	..	..	1	106	1	261	15	456	28	401
June ..	" ..	18	298	13	294	8	382	2	355	3	416	7	291	34	391	85	348
Total ..	..	40	308	25	325	26	375	7	341	14	357	11	317	81	413	204	335
September ..	Jersey ..	225	306	44	324	88	348	29	358	57	381	23	359	235	370	701	344
December ..	" ..	88	293	32	282	41	303	21	331	28	343	11	330	115	371	336	328
March ..	" ..	106	295	54	316	27	352	46	378	29	386	36	411	153	371	451	350
June ..	" ..	551	309	210	355	183	375	163	387	153	401	125	412	673	390	2,058	365
Total ..	..	970	305	340	338	339	358	259	373	267	389	195	401	1,176	382	3,546	356
September ..	Red Poll	5	293	1	224	3	255	1	503	1	355	3	304	15	360	29	332
December ..	" ..	8	271	4	305	..	..	3	335	2	321	4	361	7	334	28	315
March ..	" ..	3	409	2	272	1	267	2	278	3	300	7	330	18	344	36	333
June ..	" ..	2	300	4	270	8	292	6	323	4	320	2	306	26	372	52	337
Total ..	..	18	303	11	277	12	281	12	334	10	317	16	330	66	357	145	330
September ..	Dairy Shorthorn	6	256	11	282	12	251	5	284	5	233	2	255	26	401	67	320
December ..	" ..	10	253	4	331	7	252	2	219	4	305	3	248	20	330	50	292
March ..	" ..	6	231	10	275	2	233	6	301	3	275	6	301	22	294	55	282
June ..	" ..	24	211	27	264	14	240	18	274	14	256	11	301	52	340	160	282
Total ..	..	46	228	52	275	35	245	31	278	26	271	22	290	120	343	332	291
September ..	A.I. Shorthorn	17	218	6	183	9	257	6	213	3	216	3	267	26	293	70	249
December ..	" ..	4	261	3	166	2	302	2	328	2	271	2	262	4	313	19	269
March ..	" ..	3	253	11	241	2	294	3	356	1	413	2	363	8	313	30	290
June ..	" ..	27	272	7	255	6	389	8	307	9	276	3	336	15	330	75	298
Total ..	..	51	252	27	222	19	307	19	287	15	273	10	306	53	308	194	287
September ..	Ayrshire	28	252	9	217	9	268	5	256	7	302	5	264	29	236	92	265
December ..	" ..	16	273	6	300	8	338	13	289	5	231	3	287	11	276	62	235
March ..	" ..	11	218	13	249	1	303	8	278	2	176	5	237	16	357	56	294
June ..	" ..	41	229	8	308	22	306	15	317	8	304	9	316	44	313	147	239
Total ..	..	96	242	36	262	40	304	41	313	22	275	22	293	100	309	357	283
September ..	All breeds	301	295	80	297	142	325	50	327	84	362	39	337	372	363	1,068	331
December ..	" ..	144	285	55	290	64	305	46	313	48	326	28	323	174	366	559	321
March ..	" ..	142	289	99	293	39	348	69	369	42	349	67	384	243	368	701	341
June ..	" ..	681	299	277	338	246	359	222	369	195	379	164	390	862	383	2,647	354
Total ..	..	1,268	295	511	318	491	341	387	357	369	365	298	376	1,651	375	4,975	343

Standard Herd Test Booklet

The Standard Herd Test Records for the quarter ended 30th June, 1948, and a full list of cows which have qualified to be placed in the Advanced Register of Merit, together with an introductory article, will appear in the Standard Herd Test Booklet, to be published in October. Free copies of this booklet may be obtained from the Superintendent of Dairying, Department of Agriculture, Melbourne, C.2.

THE VEGETABLE GARDEN

By George Hyam, Horticultural Supervisor

SUMMER GREEN LEAF VEGETABLES

ALTHOUGH there is an abundance of choice of summer vegetables, the growing of green-leaf vegetables for cooking should not be confined to the winter and spring; they are equally essential in the summer. Silver beet, sown or planted in September will be yielding well from November, and will continue to produce for the ensuing eight or nine months if the leaves are carefully picked.

Seedlings of Parisian cabbage can still be planted, and these will be ready for use in late November until well into the New Year, though this planting is not recommended for the hotter inland districts. If the seeds of St. John's Day or Golden Acre cabbage are sown this month, they will be ready when the Parisians finish.

Chinese cabbage provides a nice change from silver beet, and can be sown in September, either direct in the beds or for transplanting. This leaf vegetable can be harvested whole and cooked like cabbage, or its leaves can be picked individually like silver beet. Space the plants 18 inches apart in the rows and 2 feet between rows. If sowing direct, plant three seeds to each station, afterwards thinning out to one plant. Chinese cabbage will stand heat well and is more suitable than either hearting cabbage or silver beet for hot and dry districts during the summer months; it can also be used for salad.

Round-seeded or summer spinach can be sown for successional crops until the end of next month in drills 12 inches apart and thinned out to 6 inches apart. As for winter spinach, the soil should be well enriched and there should be no check in growth through lack of moisture. This species is generally easier to grow than the winter kind, as it is less subject to disease.

New Zealand spinach can also be sown this month, and, for most home gardeners, it is the best type to grow, especially in northern areas. It is very adaptable as to soil, and can be sown in any odd corner,

and, once established, the plot will last for years as it seeds itself as well as forming new plants by "layers" from the stems which grow prostrate. Frequent cutting will provide a continuous succession of new shoots. Poultry keepers will find New Zealand spinach, silver beet, and Chinese cabbage high-yielding crops for summer green feed, and can be advised to plant extra areas for their birds.

PREPARING FOR SUMMER PLANTING

All summer vegetables do best in beds that have been prepared well in advance of planting. Consequently, no time should be lost in preparing for the planting or sowing of tomatoes, beans, vine vegetables, sweet corn, peppers, or egg plant. Weed growth turned in now quickly decays, and this, with the addition of stable manure or compost, will increase the water-holding capacity of the soil in dry weather by providing humus. Organic matter should not be turned under too deeply—6 inches is deep enough. Surface cultivation until planting time next month will reduce the labour of weeding later. Except for beans, for which superphosphate is used, apply about 2 oz. to the square yard of a complete manure such as market garden, or 3 : 1 : 1 superphosphate, sulphate of ammonia and potash to the surface of the soil, and rake this in about a fortnight before planting. For vine vegetables, dig a hole about 18 inches deep under each site and place about a 4 to 6-in. layer of rotted organic manure at the bottom, afterwards filling in the soil so as to form a small hill to plant upon.

SUMMER SALAD CROPS

To obtain a continuous succession of lettuce throughout the summer, a small sowing should be made very three weeks. In the home garden, the easiest way to do this is to sow a few seeds in pots as thinly as possible and afterwards prick them out into a box of soil as soon as the first pair of leaves appear, in the same way as is done for tomatoes and flower seedlings.

Lettuce seedlings sown in open beds and transplanted from these always show a considerable percentage of loss and the check they receive often causes them to fail to heart in hot weather. If cut out of the seedling box with a ball of soil adhering to their roots this check will be avoided. If this is not done, the best way is to sow the seeds direct in the beds and thin out. In southern districts sow Imperial 615 or New York, but, north of the Divide, Imperial 44 or Iceberg will be better. A newer variety, Great Lakes, could be sown in all districts. This is known to stand hot weather well. Radishes grow fast during spring and summer, taking only five or six weeks to come to maturity, they are likewise best sown in succession at fortnightly intervals. Radishes can well be sown between the rows of slower-maturing crops.

OTHER SEPTEMBER WORK

All kinds of root crops, except turnips, can be sown in all districts in September. Main-crop peas, like Greenfeast and Telephone, produce their heaviest crops from September sowings in the southern areas. For those gardeners who like to try the less common vegetables, a sowing of sugar peas can be recommended. They are sown in the same way as ordinary garden peas, but, to be at their best, they should be staked. Their pod is edible and is sliced and cooked like French beans before the seed fully develops, or they can be shelled like other peas at a later stage. The sugar pea provides a better return for the space it occupies compared with garden peas, as it is a prolific bearer and provides a new culinary flavour.

All cut-over stumps of winter and spring green-leaved vegetables should be promptly rooted out, otherwise they form a breeding ground for cabbage pests.



Give the rhubarb bed regular applications of liquid manure in the growing season.

Early-planted potatoes will need hilling up, and, in wet districts, it is advisable to apply a Bordeaux spray to the foliage.

Tomato seedlings grown under shelter should now be hardened off by full exposure unless the night promises to be frosty.

In most districts, the seeds of marrows can be planted out in the beds at the end of the month, as they are rather slower in germination than other vine vegetables. Early-planted onions will now be starting to bulb and will benefit by a light side-dressing of sulphate of ammonia or nitrate of soda which should be watered in.

Asparagus and rhubarb beds will now be producing, and fortnightly applications of liquid manure will produce more and better sticks. Home gardeners who wish to produce either of these plants from seed for future planting are reminded that September is a good month to sow. Plant in drills, sowing the seed about $\frac{3}{4}$ inch deep, thinning the plants out to 2 inches apart in the first instance.

Snails and slugs are active in September, and should be destroyed by one of the commercial baits to prevent a build-up of later broods.

GARDEN NOTES

By T. H. Kneen, B.Agr.Sc., Principal, School of Primary Agriculture and Horticulture, Burnley Gardens.

SPRING SOWING OF LAWNS

ESTABLISHING a lawn on a new home site is not made any easier if the building operations have resulted in clay sub-soil being distributed over the garden area. Excavations for sewers and drains may produce the same effect, while there are likely to be considerable deposits of lime and mortar near the building.

The first thing to do is to inspect the area carefully with a view to digging and grading the ground in such a way that there is a more or less uniform depth of top-soil over the whole area. Low spots may be built up by first removing the top-soil and building up the clay sub-soil with clay overburden from elsewhere and then replacing the top-soil. Unless the soil is very deep it is best to treat high spots by removing the top-soil to one side and then removing altogether some of the sub-soil, after which the top-soil is replaced. The sub-soil can be used elsewhere to build up a low spot.

Provided the quantity is not too great, and levels will not be seriously affected, another way of dealing with clay overburden is to trench the ground, by which method the positions of the clay overburden and original top-soil can be reversed.

The next step is to dig the whole area over deeply. Subsequent cultivations should be no deeper than 4 to 6 inches, and should be designed to reduce the surface few inches of soil to a very fine tilth. Cultivations of heavy soils should not be attempted except when the soil is in a friable free-working condition. It may take many months to produce a fine seed-bed in heavy soils. Undue haste in preparing the seed-bed is likely to result in poor germination, and, later, patchy and uneven growth. In their haste to establish a lawn, many people import large quantities of sandy loam and spread it over the surface of badly-prepared ground to a depth of several inches. While germination in such conditions is usually quite good, the subsequent growth reflects the true state of preparation of the underlying soil.

A lawn is a permanent feature and its establishment in most soils means really hard work. Most failures of lawns are due to faulty preparation of the ground; another point in favour of an extended period of preparation is that weeds can be destroyed as fast as they germinate.

The choice of suitable grasses for many home gardeners is not easy to make. It is necessary to establish true turf-forming grasses and to use seed of good germination, free of weed seeds. Most people desire an evergreen lawn of the "English" type, consisting wholly of grasses, but are puzzled by the various mixtures sold over the counter. These mixtures may contain one or more of a dozen grasses of varying suitability for the purpose—bents, fescues, rye grasses, brown top, and so on. In general it is best to purchase seed from reputable firms specializing in the sale of seeds. A further point is that the best mixtures, although dearest to buy, will have fewer, or more probably none, of the cheap and second-rate grasses. The mixture containing "a bit of everything" is not likely to be a success, however impressive the table of contents.

The two most important fine turf-forming grasses are Cheving's Fescue (produced in New Zealand) and New Zealand certified Brown Top. Brown Top is one of the bent grasses—another type known as Dryland Brown Top possesses greater hardness and is quite as suitable as Brown Top.

An alternative to buying a ready-compounded mixture, therefore, is to buy the best kinds separately and make your own mixture. The standard mixture for each 100 square yards of a first-quality fine lawn, as recommended by the Department, is 5 lb. of Cheving's Fescue and 2 lb. of Brown Top (N.Z. Certified). In expert hands the quantities can be reduced considerably, thus reducing the cost. The fescue can be omitted altogether to reduce cost, provided the quantity of Brown Top is increased by 50 per cent.

(continued on page 432.)

CERTIFIED PULLORUM-TESTED FLOCKS (POULTRY)

A certified Pullorum-Tested Flock is one in which all stock over six months of age have given a negative reaction to the agglutination test for Pullorum Disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector.

The undermentioned flocks have been certified by the Department of Agriculture, and will remain so for the current calendar year, or until such time as the Chief Veterinary Inspector determines.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, G.2.

Particulars of breeds of birds tested are as shown hereunder:—

A. Australorp; B. White Leghorn; C. Rhode Island Red; D. Sussex; E. Langshan;
F. Brown Leghorn; G. Buff Orpington; H. Black Leghorn; I. Minorca.

Owner.	Breed.	Number of Birds.	Owner.	Breed.	Number of Birds.
Agricultural College, Dookie ..	A, B	2,120	Gedye Bros., Railway-road, Blackburn ..	A, B	4,594
Anderson, G., Greensborough-road, Macleod ..	A	1,409	Giarrusso, G., Braeside ..	B	801
Andrew, C. S., Longlands-road, Mitcham ..	B, E	496	Graham, C., "All Black Poultry Farm," ..	A	60
Anguey, H., Hargrave-street, Castlemaine ..	A	775	Portarlington ..		
Arnold, J. B., Terrara-road, Vermont ..	A	713	Greenham, D. J., Canterbury-road, Ringwood ..	A, B	906
Ashgrove Stud Poultry Farm, Cockatoo ..	A, B, C	4,427	Grenville, G. W., Springvale-road, Spring- ..	A, B, C	3,327
	D, E		vale ..		
Avonlea Poultry Farm, A. E. Gibbs, Prop., ..	A, B	3,981	Grosvenor, E. W., and E. K., "The Haven ..	A, B, C	566
Stanhope ..			Poultry Farm," Springvale ..		
Baker, J. V., Albion-crescent, Greensborough ..	A	699	Guy, C. J., "Murlea," Murgheboluc ..	A, B, C	557
Baztiek, K., Old Dandenong-road, Heather- ..	A, B	2,375			
ton ..			Gwyther, R. P., Highton ..	B	1,220
Barastoc Experimental Farm, P.O., Croydon ..	A, B	1,376			
Barnes, Mrs. A., The Heights Poultry ..	A, B, C	3,323	Hall, R. H., Wal Wal ..	A, B	857
Farm, Blackburn-road, Blackburn ..			Hall, W. S., Cairns-road, Lyndhurst ..	A, B, C	1,081
Bartlett, N. M., Pimpino ..	A, B	204	Hamblin, N. A., "Sunny Hill Poultry Farm," ..	A, B	2,905
Bastin, W., Banbury-road, Reservoir ..	A, B	1,278	Toolleen ..		
Batey, F. A., Katandra North ..	A	141	Hamilton, W. J., Wood-street, Stawell ..	A, B	945
Batey, L. J., Katandra North ..	B	887	Hanson, S. H., Box 7, Kilmore ..	A	206
Batey, R. F., Invergordon South, via Tally- ..	A	1,599	Harrington, W. H., 179 Woodward-street, ..	A, B, C	1,764
garopna ..			Golden Square ..		
Bayfield, A. E., Westall-road, Spring Vale ..	B, C	1,381	Harrison, Mrs. A., Shenfield-street, Cobden ..	A, B	247
Betts, L. J., Moolap ..	B	939	Hayes Bros., Mt. Dandenong-road, Montrose ..	A, B	2,651
Billman, J. H., Skene-street, Bendigo ..	A, B, C	742	Hemphill, A. E., Monegetta ..	A, B	522
Bingley, A., 333 Highbury-road, Burwood ..	A, B	2,062	Henderson, C. W., "Clifton," Shepparton ..	A	462
Bishop, Mrs. P. M., Springvale-road, Spring- ..	A, B, C	1,601	East ..		
vale South ..			Henderson, W. R., 22 Chesterville-road, ..	A, I	228
Boyce, A. D., Springvale-road, Forest Hill ..	B	2,139	Cheltenham ..		
Bray, J., 18 Hotham-street, Warrnambool ..	B	96	Hewett, A., Central-avenue, Bayswater ..	B, C	1,415
Broom, S. G., Scott-street, Vermont ..	B	396	Hewitt's Poultry Farm, Skene-street, Bendigo ..	A, B, C	1,374
Brumby, W. E., Ellendale-road, Noble Park ..	A, C	402	Hines, B., Box 80, Donald ..	B	425
			Hines, W., Traynor's Lagoon, via St. Arnaud ..	B	345
Calder, R. A., Langwarrin ..	A, B	1,135	Hooker, Mrs. B. L., Cr. Heatherton and ..	A, B, C	957
Canning, P. G., Shepparton East ..	B	3,974	Westall roads, Springvale ..		
Carilla Poultry Farm, (J. A. Stoneman), ..	C, F	276	Howard, A. P., Brookville, Kyneton ..	A, B	1,273
Campbell's-road, Brlar Hill ..			Hunt, R. R., 365 Highbury-road, Burwood ..	A, B	1,197
Cashin's Poultry Farm, Stawell ..	A, B	3,860	Hurst, Mrs. B. H. G., New-street, Eltham ..	B	1,636
Chapman, Mrs. E. E., Youanmite ..	A	253			
Christie and Son, Tucker-road, Bentleigh ..	A, B, C	1,146	Inglis, W., Cobham-road, Mitcham ..	A, B	459
Clark, H. N., Bayswater-road, Croydon ..	A, B	4,871			
Clements, Wm. H., 7 Crown-road, Ivanhoe, ..	B, C	60	Jackson, Miss E. M., 4 Monash-street, Box ..	B	52
N.21 ..			Hill ..		
Coakes, G., Central-avenue, Bayswater ..	B	352	Jenkins, A. E., Pen-y-bryn, Kallista ..	C	1,076
Collins, A. J., Old Beaconsfield-road, Emerald ..	A, B	473	Johanson, A., Sunray-avenue, Cheltenham ..	B	651
Cokuhuon, W. L., "Aringa," Ringwood ..	A, B	146	Johnson, A. S., Burwood-road, Lower Fern- ..	A, B, C	2,424
Cook and McKnight, Croydon North ..	A, B	1,354	tree Gully ..		
Corbett Bros., Torbay-road, Macleod ..	A	2,458			
Crowle, L. Z., "Monomeeth," Broadford ..	A, B	900	Kay, V., 12 Wellington-avenue, Blackburn ..	B, C	2,776
			Kemp, H. L., Whitehorse-road, Ringwood ..	A, B, C, D	2,465
Davey, A. R., Sellars-street, Greensborough ..	A, B	1,271	Kerr, J. J., Clarke-road, Springvale ..	A, B	2,310
Davison and O'Keefe, 22 Sherbrook-avenue, ..	A, B	144			
Ringwood ..			Lang, J., 46 Dundas-street, Thornbury ..	E	124
Davies, L. F., off Westall-road, Springvale ..	B, C	2,198	Lawson, A. J., Box 167, Horsham ..	A, B	416
Dawson, R., Maldon-road, Castlemaine ..	B	1,586	Lechte, Bros., "Dondardon Poultry Farm," ..	B	1,485
Day, L., Kyvalley ..	A, B, C	1,717	Mt. Waverley ..		
Dent, A. T., "Ridgeway," Sellars-street, ..	A, B	1,178	Lintermans, Messrs. W. A. J. and Son, ..	C	879
Greensborough ..			Major-road, Lysterfield ..		
Dobson, C. W., Whittlesea ..	C	108	Lonic, R. A., 1 Chanak-avenue, East Malvern, ..	B	38
			S.E.5 ..		
Dyson, F., Post Office, Mooroopna ..	A, B, C	744	Longerenong Agricultural College, Doon ..	B	372
			Lucas, G., 4 Downing-street, Blackburn ..	A, B	1,967
Emmott, J. T., Verdon-street, Inglewood ..	A, B, C	314			
Everard, H. L., Hawkesdale ..	A, B, C	924	Magnusson, L., Nathalia ..	B	952
			Maher, Allan E., "Alandale," Wal Wal ..	B	748
Fellows, J., Yan Yean-road, Plenty ..	A, B, C	521	Major, C. D., Simpson's-road, Eaglehawk ..	A, B	2,021
Fitchett, C. W., Springvale-road, Tally Ho ..	B	2,996	Marshman, A. R., Archie's Creek ..	A, B, C	936
Ford, J. V., 11 Barkers-avenue, Shepparton ..	A, B, C	997	Mayne, N., Brandy Creek-road, Warragul ..	A, B	77
Fraser, R. A., Colchester-road, Kilsyth ..	A, B, C	1,185	McCabe, R., Gladstone-road, Dandenong ..	A, B	2,168
Frye, I. H., Grimshaw-road, Watsonia ..	A, B	1,996	McCann, Messrs. R. and Son, Crowlands-road, ..	B	3,456
Fullerton, G. H., 57 Just Point, Long Gully, ..	A, B, C	344	Stawell ..		
Bendigo ..					

CERTIFIED PULLORUM-TESTED FLOCKS (POULTRY)—continued.

Owner.	Breed.	Number of Birds.	Owner.	Breed.	Number of Birds.
McErvale, P. A., Kingclare Poultry Farm, Boronia-road, Vermont	A, B	2,874	San Miguel, A. S., Woodhouse-grove, Box Hill	A, B	2,210
McLaren, A. D., Mooroopna	A, B, C	360	Scales, J., West Wattletree-road, Boronia ..	A	1,382
McLauchlan, D. F., Rossiter-road, Koo-wee-rup	A, B	2,147	Schulze, Mrs. C. A., Box 52, Dimboola ..	A, B	200
McNamara, E., Sherbrooke Hatchery, 49 Whitehorse-road, Ringwood	A, B, C	546	Scouler, R. C., Tarrant-street, Cobden ..	A, B	489
McNamara, O. J., 24 Sherbrooke-avenue, Ringwood	A, B, C	1,716	Settle, J. H., Stanhope	A, B, C	1,484
McVay, A., Kernot-street, West Footscray	A, B	2,681	Simmons, J. T., 6 Lindsay-avenue, Murrumbena	B	29
Mead, J. L., 28 Golf Links-road, Oakleigh ..	A, B	317	Simpson, G. D., May-road, Glen Waverley	B	7,106
Meier, C. G., "Bylands," Sydney-road, Kilmore	A, D	40	Smith, A. H., Marong-road, Malden Gully	A, B, C	1,100
Merrett, A. W., Albert-street, Sebastopol ..	A, B, C	239	Smith, W. T., and F. W., Panton Hills ..	A, B	1,832
Milligan, V. R., State School, Ballendella ..	B	35	Snodgrass, R., Pakenham East	B	1,015
Milner, Messrs. T. and Son, Austin-crescent, Pascoe Vale	A, B, E	2,800	Stant, Messrs. W. J., and F. E., Springvale Chick Service, Westall-road, Springvale	A, B, C	3,996
Molson's White Leghorn Stud (H. Durkin, Manager), 188 Surrey-road, Blackburn	B	1,089	State Research Farm, Werribee	A, B	903
Monsant, J., Malden Gully, via Bendigo ..	A	1,557	Statham, S. B., 16 Inglewood-road, St. Arnaud	A	688
Moore, H. A., Warrandyte-road, Ringwood North	A, B	1,062	Stewart, J. A., Maldon-road, Castlemaine ..	A, B	520
Morgan, S. G., Glenburnie-road, Mitcham ..	A, B	655	Stewart, P. D., Bayswater-road, Croydon ..	A, B	987
Moroney, J. B., Kangaroo Flat	A, B	1,670	Stiles Bros., "Fairview," Wallan	B	871
Mumford, L. J., Healesville	A	393	Streeter, H. A., Avoca	B	544
Nemet, P., Springvale-road, Springvale South	A, B, C	2,391	Success Poultry Farm, 13 Knight-street, Shepparton (C. Hopkins, Proprietor)	A, B, C	1,362
Newland, F. J., "Kalang," Lubeck	A, B, C	1,556	Swift, D. A., Kangaroo Flat	A, B	2,468
Overman, V. C., Vernal-avenue, Mitcham ..	A, B	1,944	Taylor, R. H., Rathgowen-road, Reservoir	A, B	2,096
Owen, H. T., Chum-road, Healesville	B	296	Thompson, G., Westall-road, Springvale ..	A, B	1,648
Paton, W. S., Glenburnie-road, Mitcham ..	A, B	626	Trince, M., Charming-street, Moorabbin ..	B	1,510
Poulton, A. W., Vickers-street, Sebastopol	A, B	1,875	Voight, A. H., Follett-road, Cheltenham ..	A, B	1,154
Rae, J., 277 Albert-street, Sebastopol, Ballarat	A, B, C	1,679	Waiting, T. F., Bayswater	A, B	1,288
Reher, F. L., Temple-street, Burwood ..	A, B, C	2,210	Wakeham, W. M., 20 Frederick-street, Heidelberg	A, C	50
Roberts, A. (Miss), "Range View," Launching Place	B, C, D	106	Walton, F. R., Woodvale-road, Boronia ..	A, C	724
Robinson, W., 11 Olive-street, Hampton, S.7	C	471	Wandong Poultry Farm, Lawn-road, Noble Park (M. E. Trembath)	A, B	1,284
Rosebank Poultry Farm, 119 Rathgowan-road, Reservoir. (H. Taylor, proprietor)	A, B, C	3,171	Wanless, W. J., Springvale South	A, B	1,882
Rossmoyne Poultry Farm, Box 38, Avoca	A, B	1,781	Watson, W. K., Greenvale-road, Somerton	A, B	860
Salmond J. B., Deer Park	H	230	Waugh, A. J., Kangaroo Flat	A, B	1,202
			Webb, A. E. H., Frankston-road, Cranbourne	A, B	6,942
			Welsh, T. A., Bayswater-road, Croydon ..	A, B	4,512
			Wernli, J. H., Wilson-street, Cheltenham ..	A, B, D	1,535
			Wesley, J. H., Kangaroo Flat	A, B, C	1,810
			Wilkinson, L., McKenzie-road, Golden Square	A, B	369
			Wimhurst, J. C., Private Bag, Tongala ..	B	323
			Winter, G., "Denehurst," Murgheboluc ..	A, C	470
			Wohlers, S., Box 17, Jung	A	300
			Wright, D. E., South-avenue, Mt. Evelyn ..	C	64

GARDEN NOTES (continued from page 430).

For large-scale lawns there is a definite place for such grasses as perennial rye-grass and Kentucky blue grass in mixtures with Brown Top. In addition, small quantities of clovers can be used with advantage under such conditions.

To ensure rapid establishment of a lawn it is recommended that sulphate of ammonia at the rate of 4 lb. per 100 square yards be incorporated in the soil at sowing time, together with 3 lb. of superphosphate. In general, lime should not be used unless it is for the purpose of improving the physical condition of heavy soils. Grasses are tolerant of moderately acid soil conditions in which many of the common weeds will not flourish.

Returning to the problem of establishing a lawn in the spring, the answer depends largely on whether or not the

soil can be given a thorough preparation. If the task is such as to lead to a late sowing, it would be wiser to postpone operations until the early autumn. If sowing is undertaken, choose mild weather when the soil is moist and friable, but not overwet, and there is a likelihood of light showers. Broadcasting of the seed is made easier and more effective by adding it to a quantity of dry sand and dividing it into two or even four parts and going over the area systematically in different directions. Avoid windy weather when sowing, as this will cause an uneven distribution of the lighter seeds. Finish the operation by raking the ground lightly to cover the seeds.

REFERENCES

Establishment, Maintenance, and Renovation of Lawns and Playgrounds by F. R. Drake, B.Agr.Sc., District Agricultural Officer.

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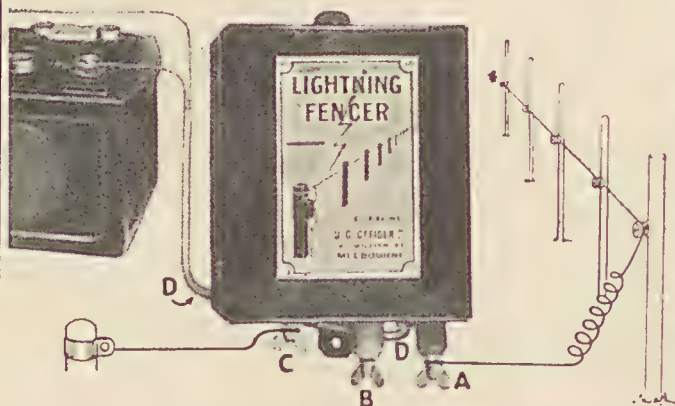
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By D. M. McAlpin, B.Agr.Sc., Horticultural Research Officer and W. A. Rolfe, Orchard Supervisor

THE commercial area under lemons in Victoria is 1,400 acres with an average production of 150,000 bushels per year. Almost 1,000 of the 1,400 acres are in southern Victoria. The remaining 400 acres are spread over the northern districts, which include the non-irrigated Warby Ranges groves, Wangaratta, and the Murray-Goulburn Valley irrigated areas at Mildura, Swan Hill, Rochester, Shepparton, and Cobram. Home-garden lemon trees represent approximately 600 acres, making a grand total of 2,000 acres under lemons in Victoria.

The greater commercial area under lemons in coastal southern Victoria is due to the closeness of the main market, Melbourne, with a population of 1½ million, and also because of the far better crops of the higher-priced summer lemon as compared with northern Victoria.

Summer crops are produced from summer-autumn flowers, and it is the experience of the inland northern growers that, in their districts, the young fruit from this flowering is usually frosted off in the winter. The external appearance and internal qualities of southern Victorian lemons are not as good as northern fruit.

The following notes record experimental results and the practices employed on the best Victorian lemon groves.

VARIETIES

Eureka and Lisbon are the main lemon varieties grown in Victoria.

Eureka is a weaker growing variety than Lisbon, has larger, darker leaves, is almost thornless, and bears coarser, more ribbed fruit than the Lisbon. Its summer crop, as a percentage of total production, is far greater than Lisbon.

In southern Victoria, strains of Lisbon, less thorny than the normal type, have been developed by careful bud selection over many years on the part of pioneer growers. The late Mr. P. Crouch of Doncaster, and later, Shepparton, selected and propagated a good type with few thorns. A northern Victorian nurseryman named this strain Doncaster Improved Lisbon. Growers generally refer to these types merely as Lisbon lemons and do not attempt to separate them from the thorny type. The less thorny strains of Lisbon are grown to a greater extent than Eureka in southern Victoria because the winter-spring fruits of Eureka are very coarse.

In the northern districts the Eureka lemon is preferred because of its thornlessness which makes harvesting much easier than with the normal type Lisbon.

Other varieties, such as Villafranca, Loram (a new type from the Rochester district), and Messina are grown to a minor extent, while a few trees of the home-garden lemon, Meyer (probably a lemon-orange hybrid), have also been planted commercially. Some growers erroneously refer to the high-quality Tahiti lime as the "Seedless Lemon". Trees and fruit of this lime are exceptionally frost tender.

ROOTSTOCKS

The rootstocks used for lemon trees in Victoria include citronelle (rough lemon), 45 per cent.; sweet orange, 25 per cent.; sour orange, 25 per cent.; and, to a lesser extent, *Poncirus trifoliata* and common lemon (usually layers or cuttings) with small numbers of trees on citron, shaddock, and mandarin.

Citronelle or Rough Lemon (*Citrus Limon*)

This stock is favoured by nurserymen. It is relatively drought resistant, and produces a large tree which bears at an early age, but the fruit, particularly when the trees are young, is rather coarse as compared with trees on sweet orange and sour orange.

Trees on citronelle stock are sensitive to wet, and are very susceptible to *phytophthora* collar rots, which often cause tree death at an early age.

Sweet Orange (*C. sinensis*)

Sweet orange as a seedling stock grows poorly in the nursery; is not much more resistant to collar rot than citronelle, and does not like dry conditions. Under good conditions and management, however, large trees are produced which bear heavy crops of high-quality fruit. Many of the best lemon groves in Victoria have been on this stock.

Sour Orange or Rough Seville (*C. Aurantium*)

Sour orange cannot be recommended as a stock for the Eureka lemon with which it shows varying degrees of incompatibility and usually grows into a poor sized tree. Lisbon lemon is recommended on this stock which is more tolerant of wet conditions and more resistant to collar rot than either citronelle or sweet orange. It has also a good effect on fruit quality. Sour orange stock cannot stand up to dry-soil conditions.

Trifoliata (*Poncirus trifoliata*)

Trifoliata is a deciduous 3-leaf stock which tolerates heavy and wet soil conditions better than the abovementioned stocks, and is immune to collar rot. Fruit quality from trees on this stock is high, and trees bear heavily at an early age, though the fruit is somewhat smaller than on other stocks.

Frost and black-pit disease resistance is helped by trifoliata stock. Its big disability as a stock is incompatibility and severe dwarfing of the scion variety.

Eureka lemon is useless on trifoliata and trees of the Lisbon variety are generally variable and small.

Common Lemon (*C. Limon*)

Layers and cuttings of lemons are not rare and cannot be recommended because common lemon roots are exceptionally susceptible to "wet feet" and collar rot. Such trees need ideal conditions if they are to last more than twenty years.

SOIL REQUIREMENTS

The ideal soils for high production and long life of lemon trees are deep, well-drained, sandy soils such as occur in northern Victoria,



A Murray Pine sand-ridge suitable for lemon growing.



Cypress windbreaks in a Victorian grove. Lemon trees need shelter to grow well and produce good fruit. Note gap in hedge (left background) for air drainage to reduce frost danger.

as ridges with a native vegetation of Murray pine trees (*Callitris robusta* RBr).

These deep sands include, among others, the classified soil types, Murray sand, Barmera sand, Berri sand, Winki sand, and Sandmount sand. The absence of limestone rubble down to a depth of 4 or 5 feet is desirable. Of course, sandy loams, loams, and clay loams have been planted with lemons in the past, but yields have often been disappointing in short-lived groves.

In the Warby Ranges, near Wangaratta, citrus is grown in a decomposed granite soil where citrus trees over 80 years old are still thriving in a commercial orchard. This, too, is a deep, open type of soil.

In southern Victoria, really good soils for lemons are rare for most of the soils are derived from Silurian sandstones, and consist of a light-grey surface soil—sandy loam to clay loam from 3 to 12 inches deep—which is underlain by a heavy water-retentive yellow to red-yellow clay. Special attention must be given to drainage in soils of this type for lemon production. Where sandy soils occur in southern Victoria, they are usually in low-lying or exposed areas, and poorly drained.

SITUATION OF THE GROVE

In selecting a site for a lemon grove it is best to aim for an easterly or north-easterly aspect, and to avoid low, frost-likely areas. Lemon trees are very sensitive to frost, and, even if the tree is not obviously damaged by winter-spring frosts, it is often found that the young developing summer crop has been frosted off.

The cold prevailing westerly and south-westerly winds in Victoria cause many problems because of their bad effects on tree growth and quantity and quality of fruit. Windbreaks are often necessary to give added protection to the grove and should be planted 8 to 10 feet apart. Pine (*Pinus radiata*) Cypress (*Cupressus Lambertiana horizontalis*), Almonds, and Tree Lucerne (*Tagasaste*) are most commonly used, though almonds are deciduous and in that respect have a disadvantage.

It is important to remember that the effect of a windbreak in a horizontal direction is approximately ten times its height—for five times its height there is a full windbreak, and, after a further five times, the wind is sweeping horizontally at its original speed again. A windbreak in a grove with an aspect facing the prevailing winds, has a very limited effect, but, where the aspect partly protects the grove a windbreak at the top has a big effective distance. Where windbreaks are planted on the low side of a lemon grove in frosty localities, gaps should be left for air drainage to reduce frost dangers.

Areas which are known to be affected by waterlogged soil conditions should be avoided for a lemon grove because lemon trees on most rootstocks are very sensitive to wet.

PLANTING METHODS AND DISTANCES

The square and rectangular systems of planting are most commonly used though the septuple and obtuse methods are not rare.



Balled nursery lemon trees ready for planting.

PLANTING SYSTEMS FOR CITRUS.

Planting Distances.		Square System.	Septuple System.
feet.		Trees per acre.	Trees per acre.
18 x 18	.. ..	134	155
20 x 20	.. ..	109	125
22 x 22	.. ..	90	103
24 x 24	.. ..	76	86

The planting distances should be varied to suit district, soil type, water availability, variety, and stock, though, for ease of working, it is often found preferable to keep all plantings on the one property at the same interval.

The following planting distances (in feet) are suggested for the main stock-scion combinations :—

PLANTING DISTANCES FOR MAIN STOCK-SCION COMBINATIONS.

Variety.	Stock.							
	Sweet Orange.		Citronelle.		Sour Orange.		Trifoliata.	
	Northern Victoria.	Southern Victoria.	Northern Victoria.	Southern Victoria.	Northern Victoria.	Southern Victoria.	Northern Victoria.	Southern Victoria.
	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
Eureka	22 x 22	18 x 18	22 x 22	18 x 18	..	..	..	..
Lisbon	24 x 24	20 x 20	24 x 24	20 x 18	22 x 20	18 x 18	18 x 16	16 x 12

In erosion-susceptible areas, contour planting is often used with a good effect on saving the soil. Such a method still leaves just as great (if not greater) need for underground drainage to remove surplus soil water. The survey work in laying out a contour planting is carried out, free of charge, by the Soil Conservation Board, Kurrajong House, Collins-street, Melbourne.

Growers prefer to plant trees which are removed from the nursery with soil around the roots to minimize the transplanting shock. Hessian is used to hold the soil. These "balled" trees are purchased where the cost of transport is small from the nursery to the orchard site.

Barerooted trees are most commonly planted because of the distances which the trees must travel. To maintain bare-rooted trees in a reasonable condition the puddling of the roots in clay is usual. Such trees must have the clay removed from the roots by washing before planting out.

DRAINAGE

In southern Victoria, lemon trees die most commonly because of "wet feet" conditions in the winter and spring, such conditions being followed by an attack of the collar rot disease.

The use of (a) surface drainage, that is, surface furrows ploughed before the winter to remove surplus surface water; and (b) underground or sub-surface tile drains, is general.



Laying underground drain 4 to 6 feet deep in a young northern Victorian grove.

Underground drains may be laid before or after planting out the grove, and the usual procedure is to lay the drains, for a start, every alternate land in a direction down the hill at a depth of from 12 to 24 inches. This figure should represent as great a depth as the impervious clay sub-soil will allow while retaining full drain efficiency. It may be found necessary, later, to drain between every row of trees.

In the lighter-textured northern Victorian soils, underground drainage at depths from 4 to 6 feet is usual, and drains may be laid in every second, third, or fourth rows according to requirements. Drainage there aims at the prevention of a water table and salt damage through seepage or over-watering.

CULTIVATION

Cultivation among lemon trees should be shallow because of the surface-rooting habit of citrus trees and their susceptibility to root diseases which may enter through damaged tissue. It is not advisable to cultivate closer to the trunk than the spread of the branches.

At the present time, growers are not cultivating so frequently during the summer because of the increasing realization that soil moisture is retained mainly through weed control. If all the weeds are killed, then further cultivation, which impairs the soil structure, is unnecessary.

However, in Victoria, there are further special reasons for cultivation. For example, in southern Victoria, as mentioned previously, surface drainage furrows are ploughed in the autumn before the winter-spring wet season. In most northern Victorian groves, the land is furrowed for irrigation.

The widespread practice of sowing leguminous cover crops in the autumn requires seed-bed preparation, and the same crop is turned under in the spring.

NUTRITION

In all Victorian soils the main aim of lemon growers is to supply nitrogen and organic matter. Certain districts and growers have their further problems of magnesium and zinc deficiencies, and boron, manganese, and common salt in poisonous quantities.

Nitrogen

A nitrogen deficiency is indicated by a general leaf yellowing, sometimes more pronounced along the veins.



Southern Victorian lemon growers plough the soil up towards the trees ("plough-no") in the autumn, leaving a surface furrow in the centre for drainage.

Nitrogen is supplied to the tree usually as an annual soil application of 8 lb. per tree of sulphate of ammonia at least three to four weeks before flowering. However, nitrate of soda, which acts even more quickly than sulphate of ammonia, is another artificial nitrogenous fertiliser sometimes applied, but should be used in smaller dressings, e.g., two applications of 4 lb. each. The organic manures also contain nitrogen and are much sought after and applied when obtainable.

Blood and bone (25 lb. per tree) and dried blood (16 lb. per tree) are referred to as organic fertilisers and are separated from organic manures because of the former's low organic matter content.

Fowl manure (90 lb. per tree), sheep manure (100 lb. per tree), and stable (horse) manure (2 to 3 cwt. per tree), are the main organic manures used in lemon groves.

These organic manures are much slower acting than the artificial fertilisers, and should be put on six weeks or more before flowering. The nitrogen from these manures is available over a much longer period.

Leguminous green cover crops may raise the nitrogen level of the soil because of the nitrogen-fixing bacterial nodules on their roots, and also supply organic matter.

All of these organic manures contain, besides nitrogen, a whole range of minerals necessary for plant growth. In addition, the organic matter plays a most important part in soil bacterial and chemical changes and the improvement of soil structure.

Potassium

Potash is used in Victorian citrus groves only as an insurance against a possible deficiency. Experimental work in Murray Valley groves has not shown any such deficiency, but, in southern Victoria, where a potassium shortage seems more likely, an application of 2 lb. of sulphate or chloride of potash every two or three years is good practice.

Phosphorus

Superphosphate is not needed for tree health in any lemon district and while desirable at the rate of 1 or 2 cwt. per acre to promote green cover crop growth, this amount is quite sufficient for any of the tree's demands.

Magnesium

Magnesium deficiency is widespread in lemon groves and is found in all districts. The leaf symptom includes an inverted V of green at the base of the leaf, and a yellow margin at the side and top of the leaf.



Prolific growth of a leguminous cover crop (lupins) in a young lemon grove. Other legumes—tick beans, field peas, medicks, and clovers are also grown.

The recommended treatment includes a soil dressing in the early spring of 3 lb. per tree of magnesium sulphate, but, at Rochester, Cobram, and Wangaratta this magnesium deficiency is associated with acid soils (often induced as a result of a residual effect of large quantities of sulphate of ammonia) and manganese toxicity.

Manganese Toxicity

The best remedial measure for manganese toxicity is to lime the soil at the rate of 1 to 2 tons per acre with a magnesium containing limestone (dolomite). Severe pruning (even skeleton pruning) in the early spring assists by immediately removing from the tree much of the poisonous manganese.

Zinc Deficiency

Zinc deficiency which is referred to as "little leaf" or "mottle leaf", is very common in northern Victoria, but almost unknown in the south.

The best corrective is to spray affected trees before one of the growth periods with a spray containing 10 lb. zinc sulphate and 5 lb. limil in 100 gallons of water. The response should be immediate as the zinc is absorbed into the leaf, and, although the old growth will become a normal green while still showing "little leaf" symptoms, the succeeding new growth will be of a normal healthy size and colour.

Lime

Lime is not used as a fertiliser to supply a need for calcium, as no calcium deficiency occurs in Victorian lemon groves. Ground agricultural limestone is applied on many soils at the rate of 1 to 2 tons per acre to reduce soil acidity, to improve soil texture, to help in the control of certain deficiencies and poisonings associated with soil acidity, and to assist soil bacterial action, nitrogen availability for the tree, and the growth of green leguminous cover crops.

IRRIGATION

The oldest commercial citrus trees in Victoria are located in the Warby Ranges, Wangaratta, where no irrigation is used, and where the annual average rainfall of 25 inches is so variable that the trees have often become defoliated through lack of moisture. The shortest-lived trees have been those which suffered from water-logging of the soil through excessive irrigation or imperfect drainage.



Magnesium deficiency symptoms first appear on the older leaves.

Southern Victoria

In cooler southern Victoria, near Melbourne, the 25 to 35-in. annual rainfall may be supplemented during the dry summer months from January to March with small quantities of water, applied at fortnightly intervals from dams built on the properties or the town water supply. This water costs 1s. per 1,000 gallons, that is, £13 12s. per acre foot. This small-scale irrigation assists in maintaining tree growth and health, and in helping the early setting of the summer-autumn flowering which produces the following season's more valuable summer crop.

Northern Victoria

In the northern Victorian irrigation areas, where the annual rainfall varies from 10 inches at Mildura to 17 inches at Cobram and Yarrawonga, water costs from 6s. to 28s. per acre foot, and, over a season, efficient watering should absorb not more than a total of $2\frac{1}{2}$ acre feet (approximately $\frac{2}{3}$ million gallons per acre).

The amounts required vary greatly according to tree size, planting distances, and climate.



The spray method of irrigation ensures an even distribution of water, and is becoming more widely used in irrigation districts.

The art of irrigation, to avoid water tables and associated salt and waterlogging problems, is to wet the soil only to the depth of the feeding roots which is no more than 3 ft. 6 in. in sandy soils and less in heavy types.

The depth of water penetration can be ascertained with the soil auger, but more rapid tests can be made by using a soil probe, which consists of a $\frac{3}{8}$ -in. diameter iron rod with a blunt end and convenient handle. The probe pushes easily through wet soil, but is stopped as soon as it meets the dry soil.

Irrigation methods

The methods of applying water to the soil include:—

(a) Sprinkler systems which are more effective than other systems in obtaining even distribution of water, and have often improved the health of salt-affected groves by the redistribution and leaching of toxic salts, particularly chlorides.

(b) Furrow systems which use two, three, or four or more furrows between the trees are the ones most adopted because of low cost. For efficiency four or more furrows are recommended. Length of run, slope, and number of furrows, besides amount of water in furrows should be closely attended to get good results, for, with this system, even distribution of water and the avoid-

ance of over and under watering are real problems.

(c) Flood or basin systems are used on some heavier soils.

(d) Flexible hose pipes or galvanized iron down-piping are used in southern Victoria to carry the water from tree to tree.

PRUNING

Lemon-tree pruning is generally practised in northern Victorian groves, but is much neglected in southern Victoria. Pruning of lemon trees results, not usually in higher yields, but in better fruit quality, more uniform bearing throughout the tree, and easier pest and disease

control, cultivation, and harvesting. The following pruning for mature trees can be recommended:—

1. Lift up the branches about 1 foot from the ground—this is called “skirting”.
2. Open the centre of the tree by removing central upright branches to obtain a vase shaped tree.
3. Remove badly placed larger branches.



The soil auger is useful in testing the soil for moisture content.

4. Remove diseased and dead twigs and spent wood from remaining branches.

Growers will find that the framing up of young trees makes later removal of large branches unnecessary. Unlike many deciduous fruit trees, e.g., the peach, the lemon tree will produce shoots freely right down to the base of the branches if adequate light gets into the tree.

The rejuvenation of manganese-poisoned trees by skeleton pruning in the early spring, that is, the complete removal of all foliage and laterals, but leaving the main limbs, is becoming more generally practised in affected areas and should be used in conjunction with soil treatments as mentioned previously.

The pruning should be carried out preferably after the heavy winter crop has been removed, and at a time when the tree can take advantage of the favorable spring growth conditions. Trees that have suffered a setback from frost injury should not be pruned until the new growth is well advanced, for then the full extent of the frost damage will be clear.

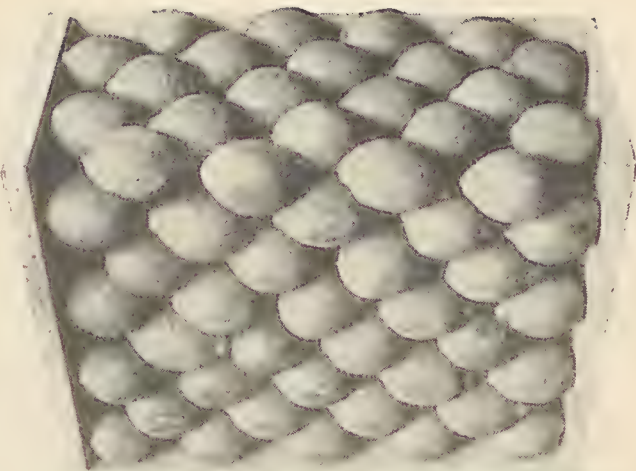
HARVESTING AND MARKETING

Lemon harvesting takes place all the year round, though the winter-spring crop represents at least 80 per cent. of the total yield. Unless high prices demand earlier picking, lemons are harvested when they are tree coloured and not according to size as practised in certain overseas countries.

The summer lemon crop often does not colour until March-April, and ethylene gas colouring or sawdust ripening of fruit picked green before this time is then carried out.

Ethylene colouring consists of placing clipped fruit in a humid atmosphere containing 1 part of ethylene in 5,000 parts of air at a temperature of from 70 to 80° F. The gas chamber should be thoroughly aired and recharged with ethylene twice a day. The lemons should colour to a waxy-yellow colour within three to seven days according to the temperature, humidity, concentration of ethylene, and condition of the fruit.

If factory demand is poor, and prices are uneconomic, it is not unusual to see the winter-spring crop allowed to hang on the



Lemons packed for market in the Australian bushel (dump) case. The side and top of the case have been removed to illustrate the recommended packing method.

tree in a tree-ripe condition till it falls in the late spring. Summer prices are considerably better, and areas with mild winters obtain reasonable summer yields—probably 30 per cent. of the total yearly crop. While an overall average lemon yield of not much more than 1 bushel per tree is obtained over Victoria, reasonably good groves average 3 to 4 bushels per tree, and groves averaging over 10 bushels per tree are not rare. Individual trees have produced as much as 1 ton of lemons in a year.

Following picking, most growers grade the fruit and pack for market in the Australian bushel (dump) case or the long bushel case. Northern growers favour the former case and lid all cases for transport purposes, while southern growers use the long bushel, and, owing to the nearness of the market, are able to leave all cases open at the top to make inspection by buyers easier. Fruit counts from fourteen to eighteen dozen per bushel case bring best prices.

Southern growers in the Doncaster, Ringwood, Burwood, and Templestowe districts near Melbourne have much lower marketing costs than northern growers. Consequently, northern-district growers who produce 95 per cent. of their lemons as a winter-spring crop have to depend mostly on factory demand.

Factories usually are willing to accept delivery of unsized lemons in corn sacks and pay contract prices which are governed largely by open market rates.

An article on diseases and insect pests of lemon trees will appear in a subsequent issue of the Journal.

CODLING MOTHS CONTROL

DDT Trials in Southern Victoria

By G. T. O'Loughlin, B.Sc., B.Agr.Sc., Assistant Entomologist, Biological Branch

SUMMARY

DDT trials for codling moth (*Cydia pomonella* L.) control on Jonathan apples were carried out on two orchards in the metropolitan area during the 1947-48 season. During the previous season, 1946-47, one of these orchards was sprayed with DDT for codling moth control, and the other with lead arsenate only.

The amounts of DDT (dispersible powder) applied in the trial varied from two sprays of 0.05 per cent. (half standard strength) DDT to five of 0.1 per cent. DDT. A calyx spray was included in some treatments. Information was also obtained on the use of DDT for control of the light brown apple moth (*Tortrix postvittana* Walk.) The results are summarized below:—

Codling Moth

1. The inclusion of a calyx spray resulted in no significant improvement in control.

2. Two cover sprays of half standard strength DDT (0.05 per cent.) gave good control where DDT had been used previously.

3. Better control was obtained where a DDT programme had been used the previous season.

Light Brown Apple Moth

1. The inclusion of a calyx spray gave significantly better control of the light brown apple moth.

2. Light brown apple moth damage became progressively greater as the amount of DDT applied was reduced.

3. Damage was considerably greater on the orchard which received DDT the previous season.

INTRODUCTION

Experiments, designed primarily to indicate the best DDT programme for codling moth control on Jonathan apples in the metropolitan area, were carried out

at two properties, one situated at Ringwood and one at Wantirna South. The following points are those on which information was desired in relation to codling moth:—

1. Minimum number of DDT sprays required.—The number of sprays was varied from two to five.

2. Importance of a calyx spray.—Some plots were given a calyx spray in addition to the cover sprays.

3. Effect of the previous season's spray schedule on control given by DDT.—In the season prior to that of the test, the Ringwood orchard received only lead arsenate for codling moth control, whilst the Wantirna South orchard received a complete DDT schedule.

4. Possibility of obtaining good control with reduced strength of DDT.—Some plots received only half standard strength DDT (0.05 per cent.).

Due to an unforeseen build-up of the light brown apple moth, the unsatisfactory control of this pest achieved by normal DDT programmes was illustrated, although this was not originally planned as part of the experiment.

TREATMENT LAYOUT

Details of plot treatments are shown in Fig. 2. The experimental areas on each orchard contained eighteen plots each of twelve trees. These were grouped in three blocks each of which contained six randomized plots representing all treatments. Single treatment plots contained twelve trees, the two central trees being those on which counts were made.

Spray Schedules

Table 1 shows the dates of application for the calyx and cover sprays. In the reduced schedules, either the fourth or the third and fourth cover sprays were omitted.

TABLE 1.

Date.	Spray.
November 3rd ..	Calyx spray at 90 per cent. petal fall
November 11th-13th ..	First cover spray
December 9th-11th ..	Second cover spray
January 14th-15th ..	Third cover spray
February 11th-12th ..	Fourth cover spray

Lure Counts

Throughout the growing season, codling moth lure counts were made at least once per week from ten lure pots on each property. The counts are shown in Fig. 1

CODLING MOTH AND LIGHT BROWN APPLE MOTH

Fig. 2 shows the extent of Codling Moth and Light Brown Apple Moth damage on both orchards with details of spray treatments.

At the Wantirna South orchard a lead arsenate cover spray (6 lb. per 100 gallons and white oil $\frac{1}{2}$ gallon) was applied on 12th February over the whole plot in an endeavour to check the light brown apple moth, but this was not successful.

DISCUSSION OF RESULTS

1. Past Spray History

As may be seen from the graphs, the trends in the percentages of both codling moth and light brown apple moth damage according to the spray used, are similar in both properties. But the important observation to make is that, in the Wantirna South orchard, there was a comparatively greater build-up of the light brown apple

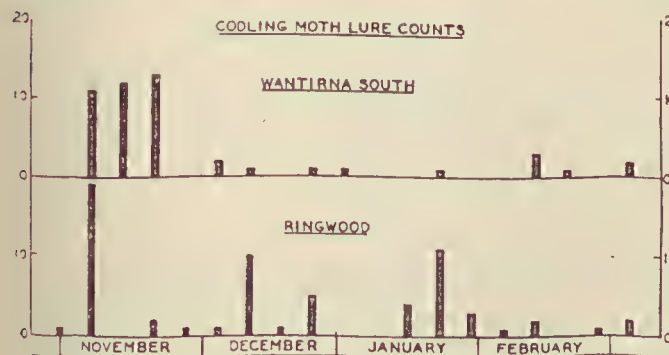
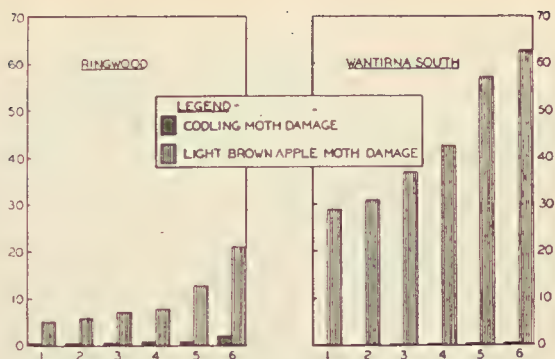


Fig. 1.



RINGWOOD		
SPRAY SCHEDULE	CODLING DAMAGE %	L.B.A.M. DAMAGE %
1 0.1% DDT-CALYX + 4 SPRAYS	0.5	5.1
2 0.1% DDT-CALYX + 3 SPRAYS	0.6	5.9
3 0.1% DDT - 4 SPRAYS	0.7	7.2
4 0.1% DDT - 3 SPRAYS	1.0	7.7
5 0.05% DDT - 4 SPRAYS	1.0	12.8
6 0.05% DDT - 3 SPRAYS	2.1	21.0

WANTIRNA SOUTH		
SPRAY SCHEDULE	CODLING DAMAGE %	L.B.A.M. DAMAGE %
1 0.1% D.D.T. CALYX + 3 SPRAYS	0.1	28.9
2 0.1% D.D.T.-CALYX + 2 SPRAYS	0.1	30.9
3 0.1% D.D.T. - 3 SPRAYS	0.2	36.9
4 0.1% D.D.T. - 2 SPRAYS	0.2	42.5
5 0.05% D.D.T. - 3 SPRAYS	0.4	57.0
6 0.05% D.D.T. - 2 SPRAYS	0.4	62.6

* PLUS LATE LEAD ARSENATE COVER SPRAY ON ALL TREATMENTS.

Fig. 2.—Per cent. damaged fruit at Ringwood and at Wantirna South.

moth along with better codling moth control. This is very probably due to the fact that, during the season prior to that of the trial, this property received a complete DDT schedule, while the Ringwood orchard received only lead arsenate for codling moth control.

Thus, it appears that, although DDT gives some degree of control of the light brown apple moth, lead arsenate is more effective. This is supported by the fact that, prior to the general change-over to DDT for codling moth control, the light brown apple moth was rarely a problem. Further evidence is shown by a survey of the position at the end of the past season, carried out in the metropolitan apple districts, by Mr. D. Morris, Assistant Entomologist, and the writer, in which it was found that without exception, heavy light brown apple moth damage was associated with the lack of early lead arsenate sprays.

2. Calyx Spray

No significant difference in codling moth infestations resulted from the inclusion of a calyx spray, but the light brown apple moth infestation was

significantly reduced, although still high. It is probable that DDT is more effective against young light brown apple moth larvae, and this would account for the better control obtained with a calyx spray.

3. Strength and Number of Sprays

Good codling moth control was obtained at Wantirna South even with two sprays of half standard strength DDT (0.05 per cent.), but, at Ringwood, control was not so good, 2.1 per cent. codling infestation resulting from three half-strength DDT sprays. All other treatments resulted in 1 per cent. damage or less. Light brown apple moth infestation tended to increase with a decrease in strength or number of sprays.

CONCLUSION

From these experiments it would appear that, on orchards where DDT has been previously used, three half-strength or two full-strength sprays will give good control of codling moth. It was also shown that the proportion of light brown apple moth increased as DDT schedules were reduced, and that DDT was not satisfactory for the control of this pest. From the results of a district survey, it would appear that the inclusion of two lead-arsenate sprays early in the season will give effective control against the light brown apple moth.

Acknowledgment

Thanks are due to Messrs. F. Dunn of Ringwood, and H. D. Jenkins of Wantirna South, for their willing co-operation in carrying out this trial. The assistance given by Orchard Supervisors, Messrs. Greatorex and Rolfe, is also greatly appreciated.

Statistical analyses were carried out by Mr. R. Jardine, of the Department of Agriculture.

Burnley Egg-Laying Competition

Monthly Progress Totals

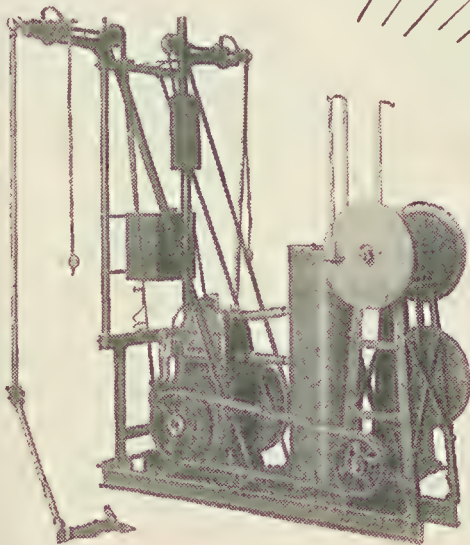
The number of first-grade eggs laid to 21st September, 1948, by the leading fowls in each class of the Burnley Egg-laying Competition, together with the names of the birds' owners, are set out in the following tables. The tests, which are being conducted at the School of Primary Agriculture and Horticulture, Swan-street, Burnley, commenced on 1st April, 1948, and will conclude on 2nd March, 1949, a period of 336 days. First-grade eggs, during the first two months of the competition, must weigh not less than 1½ oz. and not less than 2 oz. thereafter.

Pen No.	Competitor.	Total First Grade Eggs.	Pen No.	Competitor.	Total First Grade Eggs.
Class 1.—White Leghorns—Wet Mash.			Class 4.—Australorps—Wet Mash.		
147	Hill, H. E.	155	35	Paton, W. S.	156
146	Goddard and Harvey	154	31	Hanson, S. H.	149
142	Gibb's Highway Stud	147	4	Beswick, A. G.	145
128	Abikhair, Les	144	16	Davis, E. C.	144
160	Lowe, G. R.	139	7	Caspar, A. and L.	143
130	Baberton, H.	138	15	Davis, E. C.	139
197	Thornton, L. J.	138			
Class 2.—White Leghorns—Dry Mash.			Class 5.—Rhode Island Reds—Wet Mash.		
205	Clements, W. H.	150	76	Fraser, D. R.	137
229	Moran, G.	143	98	Wear, J.	135
235	Skinner, A. A.	142	80	Grenville Stud Poultry Farm	131
230	Moran, G.	134	71	Cropley, H. J.	125
215	French, R. E.	133	63	Seven Acres Poultry Farm	121
Class 3.—Light Breeds, other than White Leghorns—Wet Mash.			89	Mills, J. J.	119
126	Woollett, C. J. (Legbars)	123	Class 5.—All Heavy Breeds, other than Rhode Island Reds and Australorps—Wet Mash.		
105	Doull, J. (Legbars)	121	54	Cocking, W. (Light Sussex)	101
104	Chalmers, H. L. (Legbars)	114	58	Lang, J. (Langshan)	93
116	Kemp, H. L. (Legbars)	113	56	Wilkinson Bros. (Light Sussex)	79
123	Wooler, J. (Ancona)	109	57	Lang, J. (Langshan)	79
115	Kemp, H. L. (Legbars)	108			

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indeed, all other types of Scale Insects such as Olive, San Jose, Wax, &c.

It should be particularly noted, however, that success depends upon two factors: Timing the application correctly and applying two sprays of oil, correctly spaced or, when economically and climatically practicable, an oil spray followed 14 days later by fumigation.

Recommendations for Victoria

First: 1 gal. Gargoyle White Oil to 40 applied approx. 15th December

Second: 1 gal. Gargoyle White Oil to 40 applied approx. 15th March

If fumigation is held up, the oil spray should be applied to hold scale in check until fumigation can be done 14 days after the March spraying for best results

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ESTIMATING A HORSE'S AGE

The Teeth as a Guide

:: By the Veterinary Staff ::

AFTER some practice it is possible to judge, fairly accurately, the age of a horse by the appearance of the teeth. This is especially so up to the age of nine years at least.

The teeth of the horse consist of six incisors or front teeth, two canines or tusches, usually absent in mares, and twelve molars or grinders in each jaw.

THE INCISOR TEETH

The horse possesses three pairs of incisor or front teeth in the upper and in the lower jaw, named respectively (commencing from the midpoint) centrals, laterals, and corners. In estimating the age, the incisor teeth of the lower jaw are usually referred to.

Temporary Incisors

Temporary teeth may be distinguished from permanent teeth by the difference in size—they are much smaller and also have a distinct neck between the root and crown. The crown is short and wide, and shell-like in appearance, and is either smooth or slightly fluted. The root or fang is small and flattened. The tables of temporary and permanent incisors both possess a depression called the cup, mark, or infundibulum. This is much shallower in the temporary than in the permanent teeth. It is always surrounded by a ring of enamel.

At birth, or within ten days, the foal possesses in each jaw the central incisors. These are followed by the laterals at from four to six weeks old (Fig. 1) and by the corners from six to nine months old. Thus, at one year old, all the temporary incisors are present, the centrals show a little wear, the posterior margin of the table being level with the anterior margin, while the corner teeth are still sharp and shell-like (Fig. 2).

At two years, all the incisor teeth show wear; the infundibulum has disappeared from the centrals and laterals and sometimes from the corners. The teeth are a little wider apart at their necks on account of the gradual widening of the jaw with age (Fig. 3).

Permanent Incisors

The permanent teeth may be distinguished from the temporary incisors by being larger, broader, and more solid-looking, less shelly, and the neck is not well marked. They possess distinct vertical grooves down the front and are usually discoloured or dirty-looking.

At two and a half years, or thereabouts, the central temporary incisors are shed. The permanent ones then make their appearance, and are level with the other teeth at three years old. Thus, at three years, a horse possesses two large central permanent teeth and four milk-teeth in each jaw (Fig. 4).

At about three and a half years the lateral milk-teeth are shed and are replaced by the permanent incisors, which become level with the centrals at four years old. At this age a horse thus possesses four large incisor teeth and two small milk-teeth in each jaw (Figs. 5 and 5A).

At four and a half years the corner milk-teeth are shed and the permanent ones appear, being well up at five years old but still sharp and shell-like. Thus, at five years old the horse possesses a full mouth of six permanent incisor teeth in each jaw (Fig. 6).

At six years the cup or infundibulum has usually disappeared by wear from the lower central incisors, but an enamel spot or star may persist for one or two years longer. The sharp edge has disappeared from the corner incisor, forming a table.



FIG. 1.—Foal

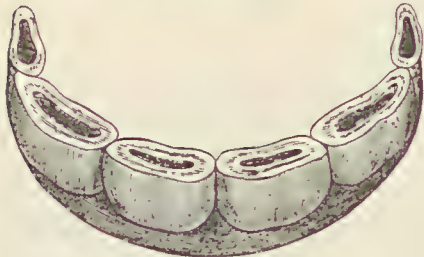


FIG. 2.—One Year

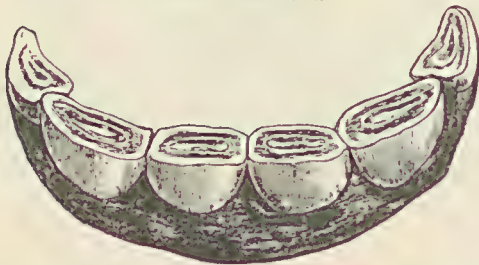


FIG. 3.—Two Years



FIG. 4.—Three Years



FIG. 5.—Four Years

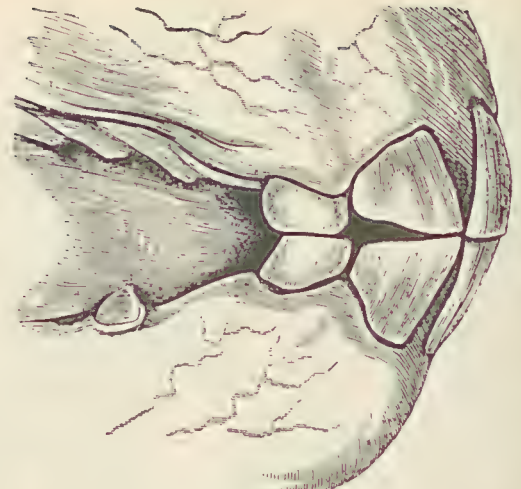


FIG. 5A.—Closed



FIG. 6.—Five Years



FIG. 7.—Six Years

Diagrams of incisor teeth showing appearance at different ages up to six years.

After six years' thoroughbred horses are usually called "aged", and, although there are certain data which assist one in estimating the age after that period, one can be much less positive on the point (Fig. 7).

At seven years the infundibulum has disappeared from the centrals and laterals, though a trace of the enamel may persist, and at this age or earlier a small projection called the hook can usually be observed at



FIG. 8.—Seven Years



FIG. 13.—Twelve Years



FIG. 9.—Eight Years



FIG. 14.—Sixteen Years



FIG. 10.—Nine Years

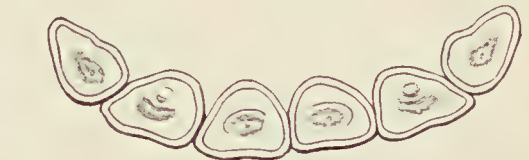


FIG. 15.—Twenty Years



FIG. 11.—Ten Years



FIG. 16.—Twenty-Four Years



FIG. 12.—Eleven Years

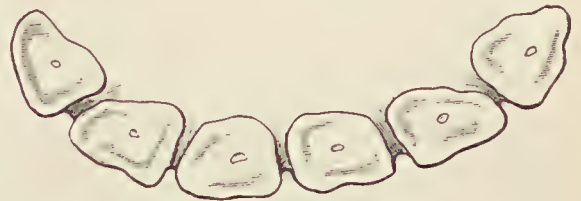


FIG. 17.—Extreme Age



FIG. 18.—Extreme Age

Tables of incisor teeth in lower jaw as they appear from seven years to extreme old age.

the posterior corner of the upper corner teeth. This is due to the fact that the lower corner incisor table does not completely oppose the table of the upper corner tooth at this time (Fig. 8).

At eight years the infundibulum has disappeared from all the lower incisor teeth, and generally the hook has worn away from the upper corner tooth (Fig. 9).

The upper incisor teeth, with the exception of the corners are rarely referred to, but it may be mentioned that as a rule the upper temporary teeth are shed a little sooner than those of the lower jaw, and moreover, the infundibulum is deeper and consequently persists about two years longer than in the opposing lower incisors.

Secondary Mark, Dental Star, or Fang Hole

As the result of the wearing away of the crown of the incisor teeth, a trace of the pulp cavity sooner or later makes its appearance. This is indicated by a slight discolouration or mark a little nearer the front of the tooth than the position of the infundibulum. This is called the star or

secondary mark. It generally appears in the central teeth of the lower jaw at eight years and in the laterals at nine years. It is readily distinguished from the infundibulum by the absence of the enamel ring.

As age advances, changes also take place in the shape of the tables of the incisor teeth. At first they are very much wider from side to side than from front to back. They subsequently become more or less triangular in outline—a change that is observed in the centrals at nine years (Fig. 10), in the laterals at ten (Fig. 11), and in the corners about eleven years (Fig. 12). Later the tables become almost round (Figs. 13 to 18), and in very old horses they are often wider from front to back than from side to side (Figs. 16 to 18).

BOOK REVIEW

"PHENOTHIAZINE, 1942-46." A Review and Bibliography, by J. Tweedle Edwards and the Imperial Bureau of Agricultural Parasitology (Helminthology), 1947. Imperial Agricultural Bureau Joint Publication No. 12.

EDWARDS reviews the literature on phenothiazine in veterinary medicine for 1942-46, and deals with pharmacology, toxicology, and the clinical application of the drug. The drug behaves differently in different species of animals, so that it is essential to consider toxicity separately for the various species. Cattle and horses are the most susceptible of all domestic animals, but the reasons for this are not at all certain. The difference between cattle and sheep is surprising, but recent studies in New Zealand by Clare (1947) (*Aust. Vet. J.* 23 : 340) suggests a reason for this difference. In cattle usually, and in sheep when a large dose is given, the conversion of phenothiazine sulphoxide to phenothiazone in the liver is not complete, so that the sulphoxide reaches the systemic circulation. Clare, Whitten and Filmer (1947) (*Aust. vet. J.* 23 : 344) showed that the sulphoxide may enter the aqueous humor of the eye and thereby produce a state of photosensitivity to sunlight leading in some cases to a severe keratitis.

The effect of the obviously different metabolism of phenothiazine on toxic effects in cattle, apart from causing keratitis, has not been determined.

Edwards notes that it has been suggested that constipation is conducive to phenothiazine poisoning, particularly in horses, but that this is not supported by experimental

or authoritative clinical evidence. It has also been suggested that the toxicity hazard is less if the dose is divided over several days, instead of being given at one time. Edwards points out that the daily divided dose was exactly what had been used in those human cases where toxic effects developed.

In the section on clinical application, the technique of administration, form of drug, preparation of patient, dose, effect of climate and farming practice, hazards and evaluation of results are discussed. The individual animals are then considered, and there are tables to indicate the degrees of efficiency against the various species of nematodes and summaries of the literature on methods of administration and toxicity.

There are brief sections on phenothiazine therapy in other animals, on the action of phenothiazine in non-helminthic diseases of domestic animals, and the use of phenothiazine in helminthiasis in man.

A bibliography for the years 1942-46, prepared by the Commonwealth Bureau of Agricultural Parasitology (Helminthology), follows and is set down under the respective years.

[Reviewed by H. Mc. L. Gordon.]

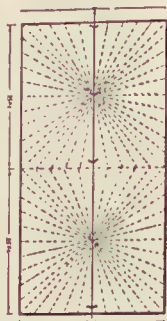
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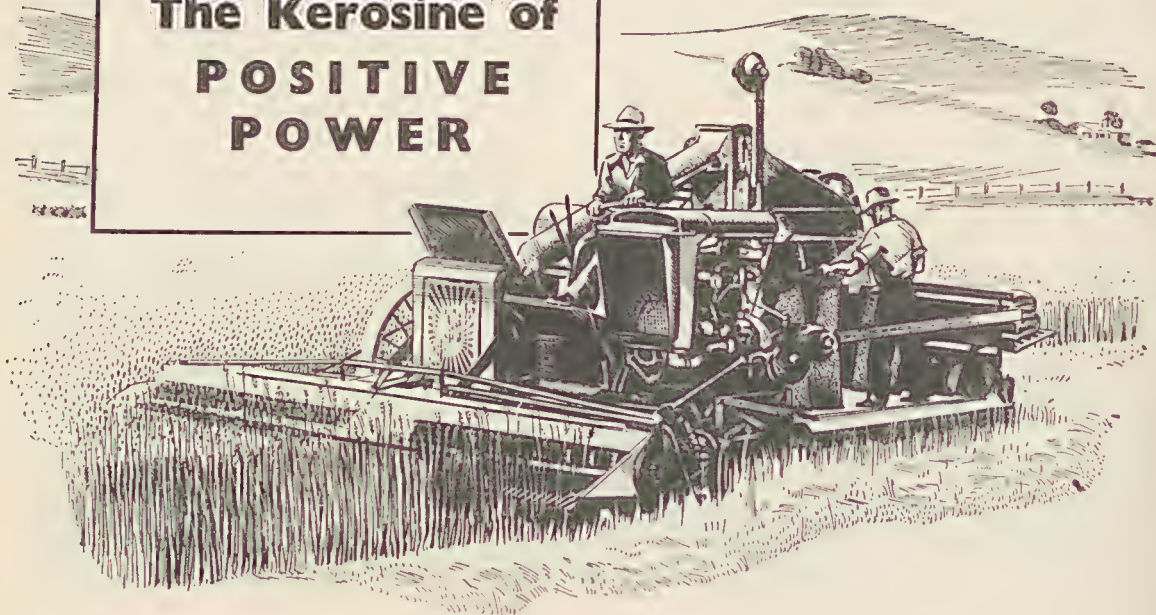
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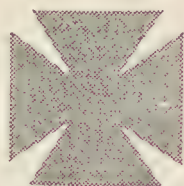
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MALLEE RESEARCH STATION

Experimental Work and Results

The following account of experimental work conducted at the Mallee Research Station was prepared by Messrs H. L. Hore, B.Agr.Sc., Senior Agronomist; H. J. Sims, M.Agr.Sc., Cerealist; and J. M. McCann, B.Agr.Sc., manager of the Station. This article, together with other material published in the September issue of the Journal, will be included in a guide book which is available for general distribution and for the information of visitors to the Station.

OATS

OATS occupy a larger area in the Mallee than is generally recognized, the average annual area sown over the last ten years being approximately 350,000 acres, compared with 1,283,000 acres of wheat for the same period.

Oat crops in the Mallee are usually sown on stubble land, without any preliminary preparation of the soil. Under these conditions fair crops may be grown in a normal season, but it is a wise procedure, particularly if fodder reserves on the farm are low, to sow at least part of the area devoted to oats on fallow land each year.

Oats may be cut for hay, stripped for grain or fed off to stock. The proportion of the oat crop used for each of the above purposes varies according to seasonal conditions. Oats as hay or grain form a very suitable fodder reserve on Mallee farms. For many years past, increasing areas of oats have been sown with the object of providing feed for sheep during the winter and early spring months. For this purpose they have proved very satisfactory, providing more feed at that time of the year than do natural or any of the sown pastures at present available. Some varieties of oats show high powers of recovery, particularly for a grain yield, after such grazing.

OAT VARIETY TRIALS

In the sixteen years since the inception of the Station, a large number of oat varieties has been tested. These are set out in their maturity groups:—

Early maturing.—Palestine, Gidgee, Orient, Mulga, Early Kherson, Kurrajong, Ballidu, Burke, Wongan, Burt's Early.

Mid-season maturing.—Fulghum, Dawn, Guyra, Kareela, Ideal, Belar, Dale.

Late maturing.—Lachlan, Algeribee, Algerian, New Zealand Cape.

Experience has shown that it is desirable to sow more than one variety of oats each year to enable maximum advantage to be taken of seasonal conditions. Also, this enables the oat harvest to be spread over a longer period and reduces the risk of loss of grain due to winds at harvest time. In those years when late rains are not experienced, the earlier maturing varieties will give better yields than the late variety, Algerian. There is little doubt that larger areas of the early varieties of oats could be sown with advantage in the Mallee, particularly in the northern portions.

There are twelve varieties of oats including crossbreds and selections in the main oat variety trials this season. These are sown in several sections on stubble land. One section is cut for hay, another is stripped for grain, and other sections are devoted to grazing. Tests are made to determine the ability of a variety

TABLE 14.—OAT VARIETY TRIALS IN THE MALLEE.

	Hay Yields (Cwts. per Acre).						Grain Yields (Bushels per Acre).					
	Sown on Stubble.			Sown on Fallow.			Sown on Stubble.		Sown on Fallow.			
	Walpeup.			Walpeup.	Woome- lang.	Ultima.	Walpeup.		Woome- lang.	Ultima.		
	Average Six Years 1942-47.	Average Ten Years, 1938-47.	Average Sixteen Years, 1932-47.	Average Six Years, 1942-47.	Average Five Years, 1943-47.	Average Five Years, 1943-47.	Average Six Years, 1942-47.	Average Ten Years, 1938-47.	Average Five Years, 1943-47.	Average Five Years, 1943-47.		
Dawn	15.4	17.3	20.5	21.9	15.9	12.2	13.2	14.4	16.3	13.9		
Algeribee	15.4	17.4	..	20.6	16.7	12.9	13.5	15.0	18.3	15.0		
Belar	14.7	..	..	21.5	18.1	12.3	12.4	..	19.9	17.3		
Mulga	14.0	16.5	19.4	23.4	18.8	12.2	12.9	15.2	16.7	16.3		
Orient	14.1	16.5	..	21.8	16.9	9.9	15.9	18.2	18.9	17.5		
Fulghum	14.2	16.0	...	21.1	16.9	11.3	12.2	14.5	17.2	16.3		
Algerian	13.7	15.8	18.8	18.0	16.5	11.8	12.2	14.2	17.8	15.0		

to recover and give a satisfactory grain yield after being grazed off in July, and also to measure the amount of grazing provided by each variety when used solely as a grazing crop. Many other varieties are tested in "junior" trials, and because of the importance of selecting varieties with good grazing characteristics combined with the ability to make a good recovery after being grazed, these trials are now carried out on stubble, grazed once, and harvested for grain.

The results of the main oat variety trial, ungrazed section, are shown in Table 14.

It will be seen that the earlier maturing varieties, Mulga and Dawn, have given higher yields of hay than Algerian.



A fourteen-bag crop of Orient oats grown on fallow at the Mallee Research Station in 1947.

Algeribee, a selection from Algerian, has also outyielded its parent, and most other varieties as well over the period it has been tested. The sowing by farmers of larger areas of this variety is warranted.

In respect to grain yields, there is little difference between the standard varieties over a period of years, although there are large annual differences due to the seasonal conditions prevailing. Highest yields of grain have been obtained from the new variety, Orient.

RECOMMENDED OAT VARIETIES

Mulga has proved the best and most reliable of the early-maturing oats for general purposes. It has some disadvantages, but, nevertheless, it is thought that all Mallee farmers who grow hay should sow a proportion of a tall-growing, early-maturing variety. Mulga provides a considerable amount of early grazing, but shows poor recovery after grazing. Where oats are sown for this purpose the variety, Orient, should be used.

Dawn.—Over a period of years Dawn has given the most consistent yields of any oat variety tested at Walpeup. It is of mid-season maturity, produces hay of good quality, and



Oat variety plots at the Mallee Research Station.

has a large brown grain. It has also proved a valuable grazing variety, giving a large bulk of green feed during winter and early spring.

Algerbee, which is a selection from Algerian was produced at the State Research Farm, Werribee, in 1938. It has proved a better yielder than its parent, both for hay and grain, and its performance in the Mallee warrants its being sown in place of Algerian. Its habit of growth is very similar to Algerian, but it produces a little more greenstuff at spring grazings, and it is slightly earlier than Algerian.

Orient, the first oat variety produced at the Mallee Research Station is a cross between Palestine and Dawn. This variety, which was named in 1947, is a special purpose oat to be used for grazing. It also has the ability to recover after grazing and produce good grain yields. Like its Palestine parent, it gives high grain yields, but is usually too short in the straw to be regarded as a satisfactory hay variety—although the hay it produces is of good quality with a high proportion of grain. Orient is an early-maturing oat.

Fulghum also is a special purpose oat well suited to give a succession of grazings throughout the year. It is a midseason variety, a little earlier in maturity than Dawn, but, owing to its weak straw, is not suitable for hay or grain.

Belar, which is also of midseason maturity, is fairly widely grown in the Mallee for hay and grain. This variety has given good results in tests in the southern Mallee; but has not been outstanding at the Research Station.

Algerian is the most widely grown variety in the Mallee. It is a late-maturing variety that gives good results when suitable spring rains are obtained. Also it is more useful than the earlier varieties for providing grazing late in the year.

However, in those years when suitable spring rains are not received, Algerian does not ripen properly, and the hay yield is light, while the grain under such conditions is not well filled.

TABLE 15.—RATE OF SEEDING TRIALS.
OATS ON STUBBLE.

Hay Section—Cwt. per Acre.

Rate of Seeding.	Average Five Years, 1933-37, Algerian.	Average Four Years, 1933-36, Mulga.	1937, Dawn.
30 lb. per acre ..	21.5	18.3	17.3
50 lb. per acre ..	22.0	19.9	17.7
70 lb. per acre ..	23.1	19.5	18.2

Grain Section—Bus. per Acre.

Rate of Seeding.	Average Three Years, 1935-37, Algerian.	Average Two Years, 1935-36, Mulga.	1937, Dawn.
30 lb. per acre ..	14.3	16.4	13.2
50 lb. per acre ..	15.2	15.0	14.4
70 lb. per acre ..	15.8	15.6	14.1

RATE OF SEEDING TRIALS WITH OATS

During the years 1933-37, rate of seeding trials were sown with Mulga, Algerian, and Dawn varieties. Prior to 1935, hay yields only were obtained, but, for the remainder of the period, grain yields were also included in the tests.

In later years, the rate of seeding trial was incorporated in the main oat variety trial sown on stubble land, and information was provided as to the most desirable seeding rates for the various varieties of oats when sown for hay, grain, or grazing. Varieties differ in the size of their grain, and also the general grain size varies from year to year. In these tests the seeding rates were adjusted to give a comparable number of plants per foot of each variety for each seeding rate. The results obtained during the four years, 1938-41, are shown in Table 16. The yields shown for each rate of seeding are the average for all varieties included in the variety trials.

A seeding of 50 lb. of seed per acre is usually regarded as a satisfactory seeding rate for oats sown on stubble land in the Mallee, and the above results show that the heavier sowings have given only slightly greater yields of both hay and grain. However, other detailed studies have proved that, as might be expected, much more feed is given by the heavier sowings when it is desired to feed off the crop. (See Table 22.)

TABLE 16.—OAT RATE OF SEEDING TRIALS (ON STUBBLE LAND).

Average Yield, all Varieties Tested, Four Years, 1938-41.

Rate of Seeding.	Hay Yield.	Grain Yield.	
		Ungrazed.	Grazed Once.
	cwt./ac.	bus./ac.	bus./ac.
Approx. 30 lb. per acre (equivalent to 5½ grains per foot)	19·3	17·8	8·5
Approx. 60 lb. per acre (equivalent to 11 grains per foot)	19·8	18·5	9·7
Approx. 90 lb. per acre (equivalent to 16½ grains per foot)	19·9	19·0	9·8

Because of the upright early growth and sparse stooling habits of the early and mid-season varieties, it is natural to consider that they should be sown considerably heavier than Algerian. Tests have not substantiated this belief, as it has been found that Algerian responds to heavier seeding in much the same way as Mulga.

MANURIAL TRIALS WITH OATS

Tests have been sown to determine the effect of various applications of superphosphate, and super. and ammonia fertilizer mixtures. This experiment, which was sown with Mulga oats on wheaten stubble ground, has shown that small increases of hay can be obtained by the use of super. and ammonia mixtures in this district, but so far the increases have not been sufficiently large to pay for the cost of the fertilizer.

Results obtained show that the use of more than 30 to 40 lb. of superphosphate per acre with oats on stubble is not justified.

TABLE 17.—OAT MANURIAL TESTS (ON STUBBLE LAND), AVERAGE SIX YEARS, 1934-39.

Treatment.	Hay Yield.
	cwt./ac.
No manure	17·1
Super., 30 lb. per acre	18·1
Super., 60 lb. per acre	18·5
Super., 30 lb., ammonium sulphate, 30 lb. per acre	18·6
Super., 60 lb., ammonium sulphate, 30 lb. per acre	19·9
Super., 60 lb., ammonium sulphate, 60 lb. per acre	20·3

It will be seen that the response of oats to superphosphate on stubble land is similar to that of wheat (see Table 9).

To determine if the superphosphate sown with the preceding wheat crop has any beneficial effect on stubble sown oats, plots are sown without manure on the site of the wheat manurial trial in the preceding year. In this manner the residual value to a crop of oats of the application of 30, 60, 90, and 120 lb. of superphosphate to the wheat crop can be determined.

The results obtained from this trial are shown in Table 18.

TABLE 18.—RESIDUAL MANURIAL TRIAL (OATS ON WHEAT STUBBLE LAND), AVERAGE SEVEN YEARS, 1937-41 AND 1946-47.

Treatment. Wheat in the Previous Year.	Oats for Hay 1937-41. and 1946-47.
	cwt./ac.
No manure	21.7
Super., 30 lb. per acre	23.1
Super., 60 lb. per acre	23.6
Super., 90 lb. per acre	23.9
Super., 120 lb. per acre	25.0

It will be seen that superphosphate, applied with the wheat on fallow, also has a beneficial effect on the subsequent stubble crop, the greater benefits being derived from the heavier dressings.

In addition to the above tests on stubble ground a series of oat plots for hay has been sown to test the effect of super. on this crop when sown on fallowed land.

The results show that when oats are sown on fallowed land they give a marked response to superphosphate.

TABLE 19.—OAT MANURIAL TRIAL FOR HAY ON FALLOW.

Treatment.	Mulga. Average, Eight Years, 1937-41 and 1945-47.	Algerian. Average, Three Years, 1938-40.
	cwt./ac.	cwt./ac.
No manure	24.0	18.6
Super., 30 lb. per acre	29.7	21.3
Super., 60 lb. per acre	31.9	23.3
Super., 90 lb. per acre	33.6	23.7

OAT GRAZING TRIALS

For some years prior to the 1943-45 drought, sheep numbers in the Mallee had been steadily increasing, and most Mallee farmers now regard sheep as a necessary adjunct to their wheat-growing activities. Unfortunately, the grazing obtained from native pastures and stubbles cannot be relied upon to supply sufficient grazing for the sheep at all times of the year—particularly if it is desired to market fat lambs. All things considered, oats appear to offer the best fodder to sow to supplement the natural feed.



Cutting oat-hay plots at the Station.

Oats for grazing should be sown as early in the season as possible. If sown dry, they can come away with the first rains and provide early winter feed.

In 1935, experiments were commenced at the Mallee Research Station, Walpeup, with the object of determining the comparative suitability of oat varieties for grazing, for either portion or the whole of their growing period.

The green feed produced by the varieties under test was determined by cutting and weighing samples, and the number of sheep carried on the various plots was also recorded.

To compare the amount of grazing provided throughout the season by the three principal varieties when sown without manure on stubble land, a comprehensive test at equivalent thicknesses of seeding (ranging from 50 to 60 lb. per acre), was conducted over a period of three years.

Three 1-acre plots of each variety were sown with the combine in April, the feed produced being fed off throughout the growing period by sheep grazing on one plot of each variety simultaneously, and then moving to the second and third series in rotation. The number of sheep used at each grazing was adjusted to the feed available, and a record kept of the number of sheep-days (number of sheep multiplied by days of grazing) for each plot of each variety. The dates and times of grazing varied with the seasonal

conditions, but each plot was grazed at least four times from July to November. The results of this experiment and more recent tests have shown that the early maturing upright growing type of oats, e.g., Mulga or Gidgee give the most feed early in the season, and that the later varieties, such as Algeribee or Algerian give a better recovery after the early grazings and provide more feed at the later grazings. Varieties of mid-season maturity, such as Dawn, give a more even spread of grazing throughout the year.

TABLE 20.—OATS FOR COMPLETE GRAZING.

*Greenstuff at Different Periods of the Year,
Yields in Cwts. per Acre. 80 per cent.
Moisture. Average Six Years, 1942-47.*

Variety.	Total All Grazings.	First Grazing July.	Second Grazing September.	Third Grazing October.
	cwt./ac.	cwt./ac.	cwt./ac.	cwt./ac.
Orient ..	29.3	7.7	12.4	9.2
Dawn ..	29.2	10.1	10.5	8.6
Fulghum ..	30.8	8.4	12.6	9.8
Algerian ..	27.7	8.0	10.2	9.5
Mulga ..	24.8	9.5	8.8	6.5
Algeribee ..	27.0	7.7	10.3	9.0
Belar ..	25.1	8.1	9.1	7.9

In a normal year, the value of feed is greatest in the winter, but green feed in November, after the native grasses have gone to seed, is very useful for late lambs. It is desirable not to rely solely on one oat variety for complete grazing, but to sow more than one variety to get maximum production at the various periods of the season. This may be done by sowing separate areas of each variety, or by mixing the seed prior to sowing. When grazing, the best plan is to fence the oats into conveniently sized paddocks, and to feed off each in rotation, resting them until a sufficient re-growth for grazing is made. Grazing at approximately monthly periods should be possible.



Oat variety grazing trials—left, ungrazed ; right, grazed.

It can be seen that the varieties, Fulghum, Orient, and Dawn provide the greatest amounts of green feed over the whole season and any of these varieties together with Algerian would provide a good succession of feed. Most early feed has been given by the varieties, Dawn and Mulga.

The tests (Table 20) allow comparisons of oat varieties for grazing throughout the growing season to be made, but in many cases grazing may be carried out over part of the growing period only; therefore, a comparison of the amount of early green-feed produced, and the ability of the different varieties to recover and produce grain is important.

It has now been adopted as a standard practice in the experimental plots that one section of the oat variety trial on stubble should be grazed in July, and the subsequent recovery yield of grain recorded. Results of this trial are given in Table 21.

TABLE 21.—RECOVERY OF OATS AFTER GRAZING.

Average Yield, Eleven Years, 1937-47.

Variety.	Average Weight Greenstuff, July.	Grain Yields.	
		Ungrazed.	Grazed Once.
	cwt./ac.	bus./ac.	bus./ac.
Mulga ..	12.2	15.0	8.0
Orient ..	11.5	18.1	11.3
Fulghum ..	11.6	14.3	10.5
Dawn ..	12.5	14.6	8.5
Algeribee ..	10.8	15.2	9.3
Algerian ..	10.2	14.5	9.4

Average Yield, Six Years, 1942-47.

Mulga ..	9.5	12.9	7.7
Orient ..	7.7	15.9	10.6
Fulghum ..	8.4	12.2	8.8
Dawn ..	10.1	13.2	8.2
Belar ..	8.1	12.4	8.8
Algeribee ..	7.7	13.5	9.3
Algerian ..	8.0	12.2	9.3

The varieties in Table 21 are arranged in their formal order of maturity. It will be seen that the early and mid-season



Sampling oat plots before grazing.

varieties have produced the greatest amounts of greenfeed at the grazing in July; also that the subsequent grain yield of all varieties tested is seriously reduced by grazing. The varieties, Orient and Fulghum, show up to advantage in this direction. An examination of the yields obtained in individual years and the incidence of the rainfall shows the importance of the spring rains in determining the recovery after grazing. If good, late rains are received, the later-maturing varieties recover much better than the early types, but, in the absence of such rains, the yield reductions as a result of feeding-off are just as great in the late as in the early varieties.

A factor of importance in determining the recovery of oats after grazing is the habit of growth of the plant. There are two distinct phases in the growth of cereal plants, the grassy or rosette stage, and the upright or reproductive stage. Grazing a crop in the grassy stage does not affect the main stools, but this grazing should be discontinued when the plant begins upright or stemmy growth. At Walpeup, with oats sown early in May, this occurs about the end of July for early varieties, and about a month later for Algerian. It has been found that even among varieties that ripen at the same time, there are big differences in the length of the grassy stage. Fulghum and Dawn, if ungrazed, ripen at approximately the same time, but Fulghum commences upright growth nearly a fortnight later than Dawn.

It has been found that the grain yield of Fulghum is less affected by grazing than that of Dawn. A similar comparison can be made between Mulga and Orient as the latter variety also has a long grassy stage and a short post-jointing stage.

When an oat crop is being sown for the purpose of grazing by stock, much more feed is obtained if heavy rates of seeding are adopted. This is well illustrated by the figures in Table 22 which gives the average weights of greenstuff obtained by sampling the rate of seeding trials in July. The yields given are the average weights of all the varieties tested and confirm the results obtained in earlier tests where Mulga and Algerian were the only varieties tested.

TABLE 22.—YIELDS OF GREENSTUFF.

Oat Rate of Seeding Trial, Average Four Years, 1938-41.

Approximate Rate of Seeding.	Yield of Greenstuff.
	cwt./ac.
30 lb. per acre (5½ grains per foot) ..	13.6
60 lb. per acre (11 grains per foot) ..	15.8
90 lb. per acre (16½ grains per foot) ..	20.1

From the table, it is seen that oats grown with the object of feeding-off should be sown thicker than normal. Rates of up to 70 lb. per acre may be applied with advantage in such cases. If the season turns out to be so favourable that grazing of the oat crop is unnecessary, no loss, and probably a gain, will result from the heavier seeding.

There are large variations in the size of the grain of different oat varieties. This factor should be borne in mind when deciding the seeding rate to be adopted. For example, the grain of Fulghum is approximately 20 per cent. smaller than that of Dawn, and to give comparable seeding rates, Dawn would be sown at 60 lb. and Fulghum at 47 lb. of seed per acre.

Experiments have shown that the use of manures with oats on stubble have increased the amount of grazing. Superphosphate and ammonia mixtures have given greater increases than superphosphate alone—but, owing to the cost of these fertilizers, their use to increase the amount of grazing is not justified under Mallee conditions.

OTHER CEREALS FOR GRAZING

Throughout these investigations, the fact that other cereals may give more grazing than oats was not ignored. There are, however, many advantages accruing from the use of oats in the Mallee. Oats are a good rotation crop with wheat, as they are resistant to many wheat diseases, while in a good year, they provide either a good hay or grain crop if allowed to recover after an early grazing. Barley is susceptible to the root-rot diseases of wheat, and, for this reason, is not a very suitable rotation crop where these diseases are troublesome. Rye grows well under difficult conditions, as regards soil and climate. It will make much more growth than other cereals on light land affected by wind erosion in the Mallee.

The average yields of greenstuff obtained from the various cereals for the four years, 1937 to 1940, are shown in Table 23. This table also gives a comparison of the grazing obtained from South Australian rye and Dawn oats over a nine-year period.

Rye has outyielded other cereals for total green fodder. While the winter feed from rye is quite satisfactory, and is readily eaten by stock, the growth in the spring is coarse and stemmy and not so palatable as oats. Rye does not make a really good hay. The South Australian strain of rye makes more early growth than Black Winter, the variety commonly grown in the colder districts of Victoria.

TABLE 23.—YIELD OF GREENSTUFF FROM VARIOUS CEREALS.

Average Three Years, 1939-41. Moisture 80 Per Cent.

Variety.	First Grazing, July.	Second Grazing, Early September.	Third Grazing, October.	Total Grazing.
	cwt./ac.	cwt./ac.	cwt./ac.	cwt./ac.
Dawn Oats ..	10.0	11.6	14.3	35.9
Cape Barley ..	7.9	10.9	18.4	37.2
Rancee 4H Wheat	8.5	9.9	15.9	34.3
Black Winter Rye	11.0	13.8	18.5	43.3
South Australian Rye ..	12.4	11.6	18.2	42.2

Average Nine Years, 1939-47.

Dawn Oats ..	10.1	10.8	10.5	31.4
South Australian Rye ..	10.0	12.3	12.6	34.9

(continued on page 468.)



LIVE STOCK NOTES

Compiled by A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

MEAT PRODUCTION

MEAT production as determined by the number of live stock slaughtered for the six months from January to June this year has been high. The weights of the animals slaughtered were as high as in the previous year, and the actual meat produced in this period amounted to about 14,000 tons more. The greatest increase was in beef and veal which provided an additional 11,000 tons, mutton and lamb increased by about 2,800 tons, and pig meats by 200 tons.

The numbers of stock slaughtered during each of the six-monthly periods since July, 1946, have been as follows:—

	1946, July to December.	1947, January to June.	1947, July to December.	1948, January to June.
Sheep	1,748,000	1,238,000	1,291,000	1,351,000
Lambs	2,403,000	1,016,000	3,541,000	1,047,000
Bullocks and bulls ..	87,000	69,000	82,000	93,000
Cows	101,000	108,000	101,000	124,000
Young cattle	22,000	24,000	24,000	30,000
Calves	170,000	96,000	181,000	104,000
Pigs	164,000	186,000	179,000	190,000

The differences in sheep and lamb slaughterings are not in proportion to the increases which have occurred in the sheep population during the abovementioned periods, and indicate that sheep numbers are being increased. This will undoubtedly result in both more wool and more lambs this spring.

The cattle slaughterings are alarming and indicate a downward trend in dairy farming, as shown by the heavier slaughterings of cows, mostly dairy cows, young cattle, and calves. The increase in bullocks slaughtered is largely due to the better prices being received. Also bullock slaughterings were affected more by the meat strike in March, 1947, than other classes of stock.

Pig-meat production has been maintained, although it is generally believed that pig breeding is declining, but the slaughter of breeding stock is temporarily keeping up production.

[A.C.T.H.]

BUTTER AND CHEESE PRODUCTION

The adverse autumn following a difficult hay harvest due to shortage of labour and bad weather conditions caused Victorian butter production to decline from 59,052 tons in 1946-47 to 56,390 tons this year, and cheese from 17,609 tons to 16,122 tons.

Production of butter increased in all the other States except South Australia, and the total Australian production in 1947-48 was 157,288 tons as against 138,408 tons in 1946-47. Greatest increase was in Queensland where production rose to 46,457 tons from the previous year's total of 33,068 tons.

Cheese production increased slightly in New South Wales, Queensland, and Western Australia, but fell away in the other States, and total production dropped from 41,828 tons in 1946-47 to 41,211 tons last year.

[A.C.T.H.]

EXPORT PRICES OF LIVE STOCK PRODUCTS

The export prices of live-stock products as set out in the 1948 Annual Report of the United Nations Food and Agriculture Organization (Australia) are tabulated below. They show the average export prices for the five years ended 1938-39 and the present contract prices with the United Kingdom. All prices are f.o.b. Australian ports.

	Five Years* Average Ending 1938-39.	1948 Contract Prices with United Kingdom.
Lamb per lb. ..	6.75d.	9.62d.
Beef and veal per lb.	3.25d.	75,000 tons @ 6½d. 15,000 tons @ 7½d.
Pork per lb. ...	6.4d.	12.38d.
Bacon and ham per lb.	15.94d.	21d.
Butter per ton ..	£108	£ s. d. 254 7 6
Wool per lb. ..	12.6d.	38.77d.*
Eggs per doz. ..	13.4d.	28d.

* Average price at Australian auctions for nine months ended 31st March, 1948.

PIG BREED POPULARITY

There have been large variations in the numbers of pigs of the different breeds entered in the Melbourne Pig Shows. These variations give some idea of the popularity

of the different breeds, and indicate also that no one breed has a monopoly of the characteristics demanded by commercial breeders.

The table presents a summary of entries at the 1939 Royal Show and the three post-war shows.

Breed.	1939.	1946.	1947.	1948.
Berkshires ..	120*2	63	72	103
Middle Whites ..	110*4	34	29	26
Large Whites ..	105	173	302*16	218
Large Blacks ..	36	25	41	62
Tamworths ..	90	41	55	70*5
Wessex Saddlebacks ..	..	29	23	30
Duroc Jerseys ..	3	..	..	..
Bacon and Pork Pig Classes ..	36†	30	50	55
Total ..	500	395	572	564

* No. of entries for group prizes or sweepstakes shown by the small figures are not included in the total.

† Nineteen of these entries only in appraisal classes.

It will be seen that the biggest change in numbers has occurred in the Middle White breed. Based on entries in post-war shows, it would appear that Middle Whites have lost a lot of ground. Classes for the Wessex Saddleback were not provided in shows prior to the war.

The next important trend is the large increase in entries for Bacon and Pork Pig classes, which were introduced just prior to the war. From nineteen entries for appraisal in 1939, the number increased to 55 this year. In the 1939 show, there were many entries of pork and bacon pigs which were not appraised, but these classes have been dropped in favour of the appraisal system.

[A. D. NORTH, B.Agr.Sc.,
Science Field Officer.]

DEHORNING

The new method of dehorning by destroying the horn buds with a hot iron when the calves are a few days to about six weeks old has proved to be very convenient. Several types of dehorning irons used for the operation are shown in the accompanying diagram.

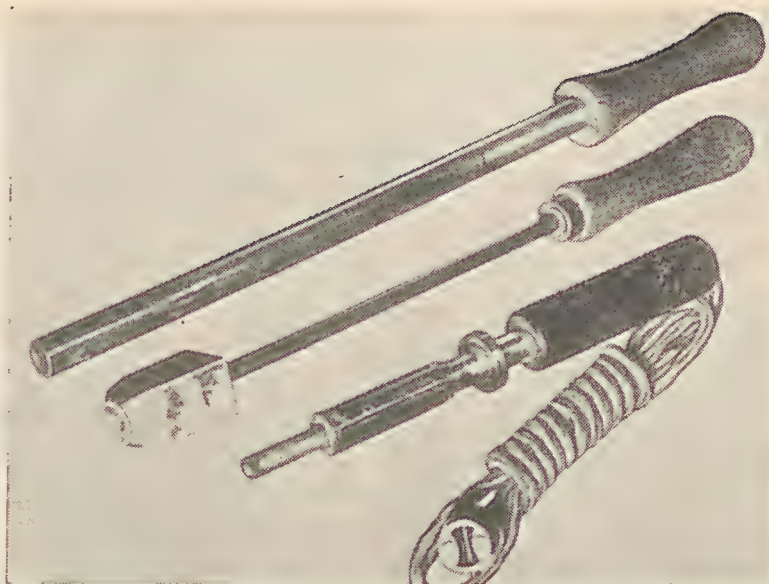
The iron is heated to a dull-red and then pressed over the horn bud, previously clipped of long hair, and held there for eight to ten seconds. The operation does not upset the calf and is very similar to fire-branding.

There are several types of satisfactory dehorning irons. Soldering irons, heated electrically or in a fire (C) can be adapted for the job. A piece of $\frac{3}{8}$ -in. boiler tubing, a $\frac{3}{8}$ -in. iron rod and a wooden handle can be made into a suitable dehorning iron (B) in the home workshop. Better-finished irons (A) can be made from $\frac{5}{8}$ -in. iron rods in an engineering workshop.

The iron should cut a ring $\frac{5}{8}$ inch in diameter or the size of a threepenny piece over the calf's horn; or, if kids are being dehorned, a smaller iron of a diameter $\frac{3}{8}$ inch overall is large enough.

The dehorning iron has several advantages. Firstly, the young animals can be dehorned at a slightly older age than when the caustic stick is used, enabling more calves or kids to be dealt with at the one time, and secondly, there are no worries about protecting the caustic sticks between disbudding operations, or selecting dry days for disbudding, or burning the calf or operator if the caustic is used carelessly.

[A.C.T.H.]

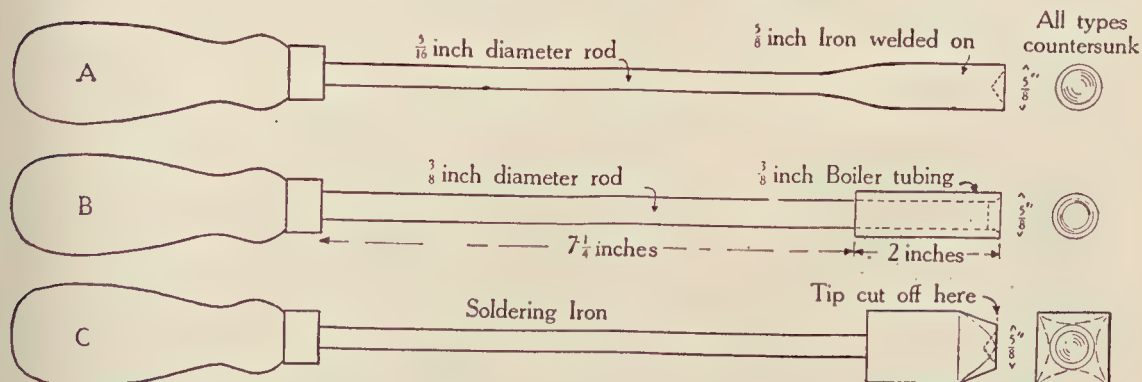


Dehorning irons. Top—An iron made from $\frac{5}{8}$ in. iron rod in an engineering workshop. Centre—Adapted on the farm from a soldering iron. Lower—Adapted from an electric soldering iron.

NATURAL INCUBATION OF EGGS

Although artificial incubation has almost completely superseded natural incubation, there is still an occasional request for information concerning the care and management of broody hens. It is an excellent method for those who desire to rear a small number of chickens with the minimum amount of attention.

Much of the success depends upon the disposition of the hen and this varies considerably. Some breeds are more dependable than others.



Three types of dehorning irons which can be made on the farm by the average handyman.

Broodiness is the first indication of a bird's desire to sit, and, if allowed to persist, she eventually becomes "clucky". When broodiness is first noted, birds may be quickly cured of the desire to sit by being confined to broody coops or cages, but, if allowed to become clucky, it is more difficult to control.

Birds selected for use as broodies should be completely clucky before being placed on eggs. Pullets are not reliable sitters, and Australorps bred along commercial lines are not always dependable. Rhode Island Reds, Light Sussex, and heavy-breed crosses, particularly those mated with Indian Game, are the most reliable.

A coop with a run attached should be placed in a secluded spot. A comfortable nest should be placed in each coop, made with soft earth and straw or pine needles. The eggs should be put in the nest and the hen placed on them at dusk. The bird should be treated for lice by dusting with an effective insect powder.

It may be necessary to confine the hen for a day or so, after which she should be taken off the nest and given water and food consisting either of wheat, oats, barley, or maize and shell-grit. She can then be let out, and may be relied upon to return to the nest after having had a run or a feed.

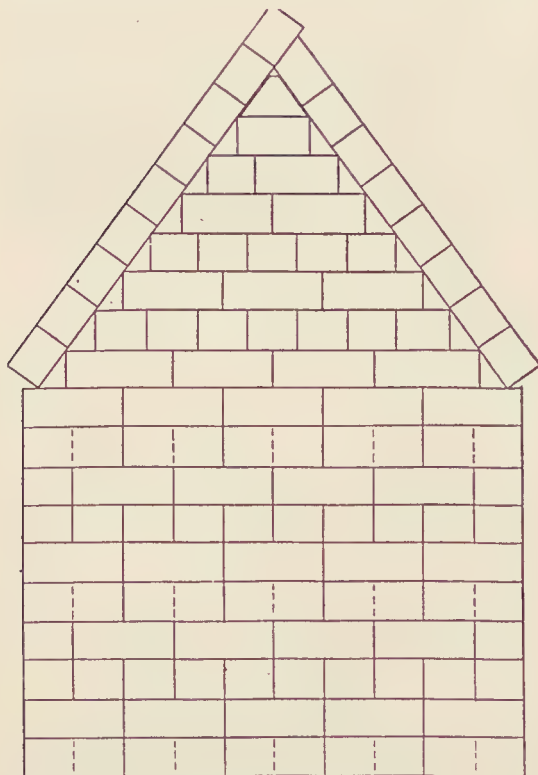
About two days before the hatch is due, the hen should be gently lifted off and once again dusted with insect powder, and then allowed to feed. By the time she goes back to the nest she will be free from vermin and the chicks will have a clean start.

After hatching, move the coop a few feet every day to given the chicks a fresh run. On the fourth day, the front of the coop should be raised a few inches to allow the chicks to run in and out, but the hen should still be kept inside. When the chicks are a fortnight old, mother and chicks should be allowed free range.

The incubation period varies with the different species of poultry:—

	Days
Hen	21
Duck	28
Duck (Muscovy) ..	35
Goose	30
Turkey	28
Pigeon	18 to 20

[M. D. HALL, Poultry Expert.



When covered with a tarpaulin this stack will shed rainwater clear of the hay.

HARVESTING GRASS HAY

Baled hay has proved to be the most popular conserved product, but what proportion of the nutrients baled in the original hay is actually consumed by the stock is difficult to assess as hay so often deteriorates in the stack. Many stacks of hay are not covered to keep out moisture, but, if an outer layer of bales is built at a steep angle over the usual steps which are left on the top of the stack, and covered with a good tarpaulin or bag cover, practically all damage can be eliminated. This outer layer of bales is built at a steep angle so that the bottom one obtains a good grip on the horizontal bale at the edge of the stack. It is placed close to the edge so that rain is shed clear of the sides of the stack. Some care is necessary when setting the first two rows of slanting bales, and a little arranging is necessary to fill the inside of the roof so that there are few gaps.

A cross-section through a stack is shown in the accompanying diagram. These roofs have proved most satisfactory where it has not been possible to store the bales in a shed. They are now common throughout Gippsland, and many may be seen on farms between Dandenong and Lang Lang.

[A.C.T.H.]

BEEKEEPING

Swarming

To cope with swarming, it is advisable to have in readiness sufficient quantities of worker combs and new hives.

The autumn secretion of the Brown and Red Stringybark put the bees in splendid condition for wintering, and most apiaries are in good shape to handle the early flow from Red Iron Bark, Yellow Gum, and Banksia, and, judging by present conditions of most apiaries, swarming and supersedure will be exceptionally heavy.

Extracting began in many districts in August to relieve the colonies of surplus stores, and give the queens room for brood expansion. It is essential that early extraction be carried out when large amounts of new honey are coming in, as failure to do so will result in clogged brood nests and excessive swarming.

A valuable asset to the working equipment during swarming time is a good spray pump and a few 4-gallon tins of water placed conveniently through the apiary. If the swarmers are sprayed liberally, it will cause them to cluster quickly and help to keep two swarms from uniting if the spray is applied between the flying swarms.

Avoid storing the empty hives in the sun. Swarms will abscond from a box that is hot. If possible use two drawn worker combs if hiving on sets of foundation. When the swarm is hived, place it in the shade. The orthodox procedure is to supply a newly-hived swarm with a comb of unsealed brood of all ages, and a small quantity of stores.

Swarms headed by virgin queens will often abscond from a hive supplied with

brood, whereas they will settle down at once if given a comb of unsealed honey along with two or three dry worker combs.

A small percentage of apiaries have suffered in some iron bark and grey box areas. It is advisable in such cases to remove the old stores and supply sugar syrup, or some good-quality wintering honey if no new nectar is available to the fielders.

These run-down colonies can be strengthened by shaking bees from strong colonies in front of the entrance on a good flying day. The young bees enter the run-down colony and the fielders return to their own hive. After this is carried out three or four times, sealed brood may be given. The danger of chilling is eliminated by supplying the extra bees before the brood is added.

In many cases, the condition of the poor colony can be attributed to the excessive use of the extractor during the honey-flow last autumn.

[W. A. COLLINS, Apiary Inspector.]

POLLINATION OF FLOWERS

The failure of lucerne and clover fields to produce large yields of fertile seed is frequently due to insufficient bees and other pollinating insects to carry pollen to the millions of flowers on each acre of a good lucerne or clover stand. For thorough pollination and a maximum setting of seed, each of these flowers has to be visited during a blossoming period of about three weeks.

The lucerne flowers have to be tripped before the bees can reach the nectar and pollen, and this means extra work for the bees. Each flower may be visited several times so that on each acre an enormous amount of work is done by the bees.

The apiarist values his bees for the nectar they bring back to the hive, but the clover-seed producer does not always appreciate the huge and valuable task performed for him by the bees. Clover-seed producers should make sure that ample bees are available to fully pollinate the blossom. One strong colony per acre is recommended.

[A.C.T.H.]

IN THE ORCHARD

By G. W. Gayford, B.Agr.Sc., Senior Horticultural Instructor

CODLING MOTH AND LIGHT BROWN APPLE MOTH

THE widespread use of DDT throughout apple and pear-growing areas last season certainly reduced the problem of codling moth, but brought with it other problems, such as severe damage from light-brown apple moth and heavy bryobia mite infestation on some properties.

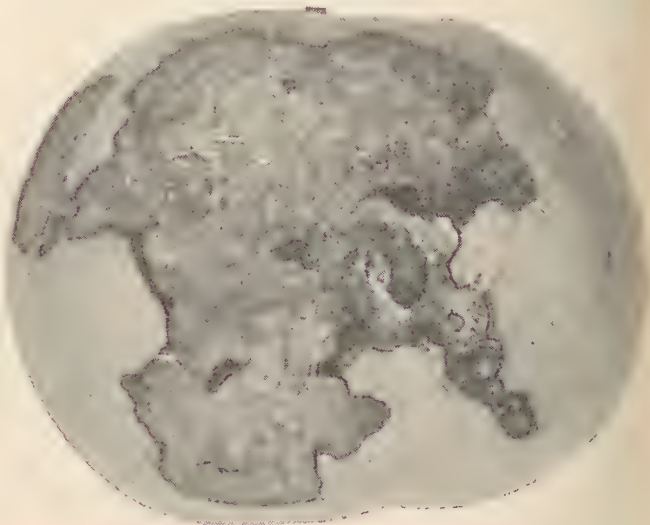
The small green grubs of the light-brown apple moth are surface feeders and caused damage in apple and pear crops, which, in some instances, exceeded that normally resulting from codling moth before DDT was used. Grubs of the light-brown apple moth can be controlled by lead-arsenate sprays at petal fall and again in mid-season. If codling moth was a problem last season it would be wise to include DDT at half strength, i.e., 0.05 per cent. in these sprays. For mixed sprays of this type, a dispersible powder DDT is suggested in preference to an emulsion, and the spray vat should be carefully cleaned out before this combination is used. The mixture should not be allowed to stand overnight.

Light-brown apple moths will be caught freely in lures and these would serve as a guide as to when lead-arsenate sprays are required.

DDT sprays for codling moth control should be timed as carefully as lead arsenate. The first spray should be applied when the emergence of the spring brood is at its height. This can be determined by the catches of moths in lures.

It has been found that oil sprays, either in combination with DDT or used in the same spray programme are likely to cause skin marking, and this particular combination should be avoided.

If bryobia mite should be active again this year, two sprays of HETP should be applied within ten days of each other. The second spray is applied to kill mites which were in the egg stage when the first spray was given. This spray is not an



Apple showing damage done by the Light Brown Apple Moth

ovicide, but is an effective contact insecticide and will kill mites at a concentration of 1 pint in 300 gallons of water.

VINE DAMAGE BY LIGHT BROWN APPLE MOTH

Grubs of the light-brown apple moth will attack bunches of grapes from shortly after setting until harvest time. Lead arsenate at a strength of 3 lb. powder in 100 gallons water will give effective control. Lures containing a 10 per cent. solution of vinegar, molasses, and sweet wine will trap moths and indicate where they are most active, and, therefore, the best time to apply the lead-arsenate sprays.

BROWN ROT IN STONE FRUITS

As a cover spray for protection against brown-rot infection in plums, peaches, nectarines, and cherries, the dry-mix sulphur-lime can be recommended. This is made by mixing 16 lb. air-blown sulphur, 8 lb. of fine-grade hydrated lime, and 1 lb. of casein spreader in 100 gallons of water. This spray should not be applied less than six weeks before fruit harvest, except on canning peaches, because of the risk of building up an unsightly deposit on the fruit.

Sulphur sprays cannot be used on apricots because of the risk of causing injury to the fruit.

PEACH RUST

Peach rust makes canning peaches unsuitable for processing because of the green depressions which occur on the fruit. The disease occurs early in the season, on the leaves where it causes small rust-coloured spots, the spores from which may give rise to later fruit infection.

Growers should make close inspections of their trees for any sign of leaf infection in the spring. If this is noticed sprays of dry-mix lime-sulphur should be applied to the trees in order to prevent later fruit infection.

SPRING CULTIVATION

Spring cultivation is necessary on non-irrigated orchards to control weeds which remove large quantities of moisture from the soil. Excessive cultivation is undesirable because it results in a destruction of soil structure accompanied by difficulty of penetration of rainwater. An over-cultivated loose soil will erode badly during summer thunder storms.

Apart from weed control, spring cultivation is required only to incorporate green manure crops, or, if during the spring and summer excessive rainfall causes the surface soil to set, cultivation would be desirable

to break up this surface layer and so reduce excessive run-off during wet weather.

RE-WORKING APPLE AND PEAR TREES

With the resumption of fruit export, apple and pear growers should give some thought to the changing over of unsuitable varieties to others more acceptable to this trade. The most suitable apple varieties are Jonathan, Granny Smith, Yates, and Delicious, while pear varieties include Packham's Triumph, Winter Cole, Winter Nelis, and Josephine.

By using one of the frameworking methods, namely, the needle graft, stub graft, or bark graft, trees can quickly be returned into production compared with the crown grafting method. More labour is required for frameworking, but quicker returns are obtained. Grafting is best done at this time of the year, and may be continued until November, as it is during this period that the bark of the tree to be grafted lifts easily.

A necessity in successful grafting is to properly seal the graft with some suitable mixture, such as tallow, beeswax and resin, or starch and bitumen emulsion. In fact, as a precaution against polystictus infection, which seems to be increasing on many properties, all cut surfaces should be covered with bituminous emulsion when trees are cut back for grafting.

Farm Water Supply

Normal milk contains about 87 per cent. of water so that, unless a cow has access to a plentiful supply of clean, fresh and palatable water, her milk flow must suffer.

The water requirements of the various classes of stock vary widely depending on the temperature and humidity of the air, the dampness of the food, succulence of the pastures, and the amount of milk secreted. High-producing cows may consume up to 50 gallons of water per day, but the average would be from 10 to 15 gallons per day.

Dairying in Victoria is mostly carried out in districts of good rainfall or in the irrigation areas, but, in planning water supplies, it is wise to work on the assumption that rain may not fall for several months in the year. The water should be fresh, palatable, and as cool as can be made with adequate shade. Clear running water in a shaded creek is ideal. Where dams are in use, they should be fenced in and a windmill used to pump water to the various paddocks. If cattle have unrestricted access to a dam, there is a danger of contamination and the water may become a means of transmitting animal parasites. Further, as the water recedes the boggy conditions contaminate udders with mud, entailing extra work in the cowshed.

[Contributed by the Dairying Division.]

THE FLOWER GARDEN . . .

By T. H. Kneen, B.Agr.Sc., Principal, School of Primary Agriculture and Horticulture, Burnley Gardens.

THE SUMMER DISPLAY

ONE of the greatest assets to the home gardener is a well-kept diary. At this time of the year, when he has to plan sowings and plantings for a floral display in the summer and autumn months, it is a simple matter to look over the notes made in February and March and recall the plants which gave pleasure, whether in his own garden or his neighbour's.

The first step would be to make an inventory of subjects which might form the basis for some planting scheme. The list should also take into consideration any plants already established.

Hollyhocks, for example, may have been sown in autumn for the following season's blooming. There may be well-established carnation plants in the beds.

A useful list might then include the following:—*Ageratum*, *Alyssum* (white and lilac varieties), *Antirrhinum* (mixed), *Aster* (mixed), *Begonia* (bedding), *Dahlia*, *Delphinium* ("Blue Butterfly"), *Dianthus* (mixed), *African and French Marigold*, *Nicotiana*, *Pentstemon*, *Petunia* (pink and rose shades), *Portulaca*, *Phlox* (pink and rose shades; also mixed), *Salpiglossis* (mixed), *Verbena* (pink and white shades), *Zinnia*.

Many gardeners devote a great amount of time to the study of colour combinations, and in this respect a diary is particularly useful. A few basic principles can be advanced, but, on the whole, most people secure pleasing harmonies without analysing them. An adequate amount of healthy foliage may prevent any discordant notes. Experience and good taste are the main factors.



Perhaps the most popular annuals for summer displays are *Ageratum*, *Marigold*, *Zinnia*, *Petunia*, *Phlox*, and *Aster*. The *Zinnia*, *Phlox*, and *Aster* are normally grown in mixed colours, and, for this reason, are relatively easy to combine with other plants. Combinations of blue and yellow in massed plantings rarely look "right"—and should not be used too freely. On the other hand, blue *Ageratum* combines well with *Viscaria* and *Phlox*. Blue *petunias* may in themselves be attractive, but are difficult to combine with other colours. Points such as these should be noted in the diary for future reference.

The following are combinations of plants which might be tried. Smaller-growing plants are listed first and larger plants last. The lists are not intended to indicate that the plants should be grown in long rows, but rather those which can be grown adjacent one to the other.

1. (a) *Zinnia linearis*, yellow; (b) *Zinnia elegans*, dahlia flowered, mixed colours; (c) *African Marigold*, yellow, gold.
2. (a) *Phlox Drummondii*, mixed colours; (b) *Antirrhinum*, rose shades.
3. (a) *Viscaria*; (b) *Viscaria* and *Phlox* (salmon shades), mixed; (c) *Asters*, mixed colours.

"RULENE"

25% P.P.¹ Isomer D.D.T.

GARDEN AND ORCHARD SPRAY

1 gallon to 250 gallons water = 0.1% D.D.T.

EASY TO MIX . . . EASY TO USE

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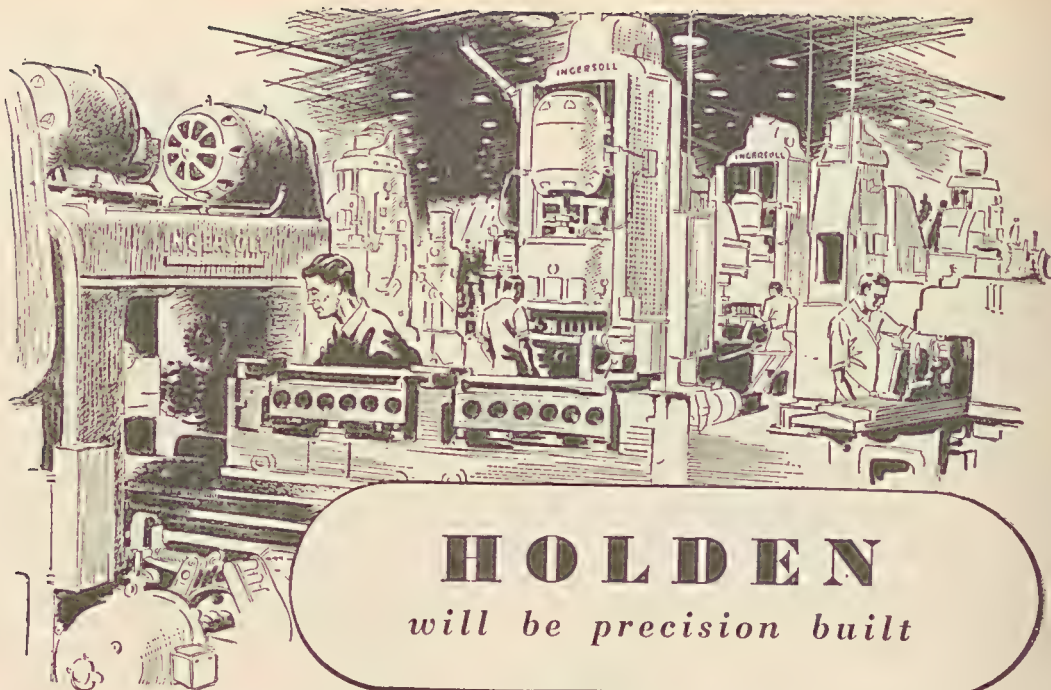
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4. (a) Phlox, mixed colours; (b) Asters, mixed colours.

5. (a) Petunia, Rose of Heaven, pink; (b) Bedding begonia, pink; (c) *Salvia farinacea*, pale blue.

A little variation could be introduced here by using 10 per cent. of blue bedding petunias with the pink variety. Pink and rose-pink dahlias such as Judith White, Little Diamond, Elvin Weiss, and Eula make an effective background.

6. (a) *Ageratum*; (b) *Viscaria*.

7. (a) Phlox, salmon rose shade; (b) *Cynoglossum*, blue; (c) *Salvia farinacea*, pale blue.

It is definitely better for the gardener to devise his own combinations, because of the variation in colours in different strains of plants. Some strains of Phlox *Drummondii*, for example, contain hard purple shades which do not harmonise readily with other flowers. It is largely a matter of individual taste.

QUESTIONS ANSWERED

Q. Are flowering fruit trees grafted on to a root stock?

A. Yes. The many species and horticultural varieties of flowering crab apples, peaches, almonds, plums, apricots, and cherries are grafted on to a suitable root-stock. The reason for this is that seedlings from any of these trees are likely to differ considerably from the parent.

The Northern Spy rootstock, used widely in the propagation of commercial fruiting varieties of apples, is also used as a stock for many of the species of crab apple. For some of the horticultural varieties of flowering crabs, seedlings of certain commercial fruiting or flower apples are preferred as stocks.

The flowering almonds, peaches, and apricots are grafted (by budding) on to seedlings of yellow-fleshed, free-stone peach varieties such as Elberta.

The apricot here referred to is *Prunus Mumé*, the Japanese apricot, often referred to as the "flowering plum" of Japan.

Flowering plums are propagated generally on Myrobolan or Cherry Plum stocks raised from cuttings, but may also be grafted on to peach seedlings. The stock generally used for flowering cherries is *Prunus serrulata*, variety *Lannesiana*, itself one of the flowering cherries.

Q. What stocks are used for roses?

A. *Rosa Noisettiana* (Maiden's Blush) or *R. multiflora* are the stocks used for bush and climbing roses. *Rosa canina* (The Dog Rose) is the stock used for standard roses. The briar rose growing wild in Victoria is unsuitable as a stock for garden roses.

Q. Can conifers be raised from seed?

A. Yes, but better results are obtained by raising them from cuttings. Cuttings taken in February or March with a "heel", and trimmed and placed in sand, can be rooted fairly easily. It is an advantage to use "bottom heat" to maintain the temperature of the rooting medium at about 70° F., especially during the winter months.

Rooting is slow and irregular, and many species will take twelve months or more to "strike". Many of the "golden" or variegated conifers are difficult to strike, but a considerable amount of evidence is accumulating that various "hormone" treatments are effective in inducing better rooting.

Q. When is the best time to move a lemon tree?

A. The best time to transplant established citrus trees is in early spring (September). Trees moved at any other season are slow to recover from the shock of transplanting.

In moving evergreen trees a large ball of earth should be retained and the top growth reduced to compensate for the loss of the root system. After moving, they should be firmly staked until established again.

Liquid manure made up by adding 2 oz. of sulphate of ammonia to 4 gallons of water, and applied to damp soil every three weeks until the lemon responds, will be of assistance. Citrus trees respond to a good mulching during the summer months.



THE VEGETABLE GARDEN

By George Hyam, Horticultural Supervisor

OCTOBER marks the commencement of the summer planting season in the vegetable garden.

In all except the mountain and high central districts, there is little danger of frost and the soil temperature is now sufficient for all summer vegetables to grow on without check under garden conditions.

In the cooler districts, and under more open conditions in the south, tomato planting is generally deferred until next month, and climbing beans, and, in southern areas, sweet corn should not be planted until late in the month. The preparation of the beds for summer crops was described in the September Journal.

BEANS

All varieties of French and butter beans can be sown now, but, in districts where the October temperature is still cool, it is advisable to use butter beans for the first sowing, as these stand cooler conditions better. Beans do best in light, friable soil which has had a good application of organic manure dug into it within the previous six months or so. They will do well after a crop of cabbage or cauliflower which had been well manured, and, on light soil, no further organic manure is necessary.

In heavy soils, liable to cake on the surface, it is advisable to dig some stable manure or compost into the top 5 or 6 inches of the soil to make it friable. The growing point of a germinating bean seed is very fragile and can easily break off if it meets a caked surface soil, thus, in clay soils, it often pays to cover the seed with light soil or sand to prevent this. Even if the beds were fertilised as outlined last month, an additional light dusting of superphosphate



A productive home vegetable garden in a Melbourne suburb.

placed in bands on each side of the seed row, 2 inches away from the seed and 2 inches deep is desirable for a good crop of beans.

Good varieties for present planting are Hawkesbury Wonder, Staley's Surprise, Feltham Prolific, and Brown Beauty.

Hawkesbury Wonder is a selection from the prolific-yielding Canadian Wonder but it has a much better resistance to wilt than the last-named variety.

Staley's Surprise yields well over an extended picking season and has long pods. Feltham Prolific is also a heavy cropper.

Brown Beauty is a leading commercial variety, but, on account of its habit of setting its pods in one flush, it is not so good for the home garden unless it is sown in small lots at fortnightly intervals.

With the other varieties, successional sowings at monthly intervals will keep supplies going. The only butter bean at present available is the Startler Wax Pod, but this is one of the best and plants will yield for at least six weeks. Successive sowings of beans are better planted well away from each other to limit the spread of red spider. Correct planting depth,

which is 2 inches in light soils and 1 inch in heavier types, is important, and better yields will be obtained from plants spaced 6 inches apart.

EARLY TOMATOES

A few early tomatoes can be planted in October in the warmer southern districts. Tatura Globe and Burwood Wonder are good varieties for this planting. Northern districts plant their main crops in October. If purchasing plants, select good hardened-off plants which will have dark-green leaves and stout bluish stems. Plant a little deeper than the original soil mark on the seedlings and water them in with a nutrient solution made by dissolving $\frac{1}{2}$ oz. of sulphate of ammonia or nitrate of soda and 1 oz. of superphosphate per gallon.

SHELTER FOR SUMMER CROPS

Shelter from wind is necessary for growing good vegetable crops at any time, but this is particularly important for summer crops. In most cases their foliage is abundant and easily wilted in hot wind. Beans in particular suffer from heavy wind, and the vines of cucurbits often fail to set fruit if blown about. Lettuce can scorch badly on north wind days, and from now onwards, does better in partly shaded positions, though all other summer vegetables do best in positions where they get full sun but some wind protection.

The effect of summer winds is less on rows running north and south than east or west, and, as there are some tall-growing summer crops, such as sweet corn, climbing beans, and staked tomatoes, these can be used to protect the low-growing crops which are more subject to wind damage. Apart from permanent breakwinds of spaced palings, tea-tree or a live hedge, commercial growers often sow strips of maize or rye-corn between summer crops. Such a breakwind will give complete protection within a distance equal to five times its height, and partial protection for about fifteen times the height. In open situations in small gardens

it is as well to see that any permanent shelter, such as a paling fence, gives sufficient protection, and if necessary, sow or plant a temporary break for summer vegetables at least. The loss of soil moisture by evaporation is much less in still air, and the setting of flowers will be much better. Whatever type of break is used see that it does not obscure sunlight, except for lettuce.

OTHER OCTOBER WORK

October is a good time to plant out seedlings of the odourless onion for fresh bulbs for use in salads or to amplify stocks of stored onions. Carrots, parsnips, and beet could be sown, but, unless especially wanted, carrots and parsnip sowings could be better deferred to the main sowing in November and December. Red beetroot sown in October grows fast, and, for summer use, a good plan is to sow some Egyptian Globe which is ready for use in about two months. Early Wonder takes a little longer. Sowings of Detroit Dark Red or Derwent Globe could be left until later to serve as the main crop, as these varieties will keep in the ground until next August. Egg-plant and capsicum seed can be sown in boxes for planting out next month, and there is still time to sow the late varieties of tomato for early December planting.

The seeds of any of the cucurbits can be sown in pots, tins, or in the open ground. In the home garden, sowing in containers is more convenient, and they can then be planted to replace some late-maturing spring crop.

Mid-season onions, such as Brown Globe, will be showing signs of bulbing, and this is the time to apply a light side-dressing of sulphate of ammonia, which should afterwards be watered in. If room permits, another crop of Greenfeast peas could be sown in October, and a row of Telephone peas on a trellis could serve as a breakwind for other crops. After picking, the vines can still remain until the end of the summer for this purpose.



Mixtures of cereals, or of early and late varieties of oats, have proved very satisfactory for grazing, and give a better "spread" of the grazing throughout the year.

Oat Diseases

Under Mallee conditions, oats are apparently not susceptible to many diseases. The most common root disease is purple patch (*Rhizoctonia solani*), but usually the patches attacked are fairly small.

*Smut*s are the most common diseases encountered. There are two types of smut commonly found in oats—known respectively as Loose Smut and Covered Smut. Of these, loose smut is the more common. The best methods of control are—

- (a) the use of clean seed wherever possible ;
- (b) the use of pickling methods similar to those for wheat.

The mercurial pickles are more effective in controlling oat smuts than copper compounds. Some varieties of oats are

resistant to both types of smut. Varieties with moderate resistance to oat smuts include Belar, Mulga, Gidgee, and Guyra.

BARLEY

The average area sown to barley in the Mallee during the last five pre-war years was 34,000 acres. This area, which then represented approximately 23 per cent. of the total sown to barley in Victoria, returned about 16 per cent. of the State's yield of this cereal. The acreage sown has varied considerably during recent years. In some seasons a satisfactory malting sample of barley is grown in the Mallee, but, in dry years, the grain produced is used mainly for feeding purposes. Most of the sowings of barley in the Mallee are made in the south-western part, namely, Rainbow, Beulah, and Hopetoun districts.

Variety trials have been conducted at Walpeup to compare the newer varieties and crossbreds for Mallee conditions. Results of this trial are shown in Table 24. Barley has also been tested for its ability to produce greenfeed (see Table 23), and is included in certain rotations of the Rotation Trials.



Portion of the hay reserves on the Mallee Research Station, August, 1948.



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FIRST STAGE



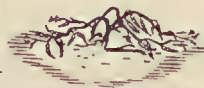
The weed absorbs "Methoxone" which causes a serious physiological disturbance owing to the high concentration of the hormone in the plant.

SECOND STAGE



The stems thicken and leaves become twisted and contorted.

THIRD STAGE



The foliage changes colour and the weed dies. Meanwhile, cereal crops also sprayed are completely unharmed.

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The Journal of Agriculture, Victoria—October, 1948

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A heavy crop of rye on light sand.

TABLE 24.—BARLEY YIELD TRIAL.

Variety.	Average, Two Years, 1940-41.	Average, Three Years, 1939-41.	Average, Four Years, 1939-41 and 1947.
	bus./ac.	bus./ac.	
Cape	30.7	26.8	27.0
Sea of Azov	28.9	..	..
Vaughn	28.4	..	..
Atlas	26.4	..	..
Pryor	25.2	22.4	22.0
Research	24.2	21.2	..

RYE

During the past few years, the value of rye for stabilizing badly-drifted areas has been demonstrated. This work is described later. The value of rye for this purpose is shown by the fact that the area-sown in the Mallee has increased from 96 acres in 1935-36 to 7,094 acres in 1947-48.

Tests have been carried out with several varieties and strains of rye, including Black Winter, Balboa, and Slav varieties, regional strains from South Australia and Tasmania, and varieties imported from overseas. Of these varieties, the one that has developed in South Australia by natural selection has proved most satisfactory. It is more upright and makes faster growth than Black Winter, which is commonly grown in southern and north-eastern Victoria.

When sowing an area to stabilize it with rye, it is important that the ground be covered with vegetation as quickly as possible, and that a large bulk of straw, to give protection to the site for several years, be grown. Accordingly, tests have been carried out with South Australian rye to determine the best rates of sowing and manuring to achieve maximum ground cover and growth of straw. Tests carried out during the period 1944-47 (Table 25), have shown that a seeding rate of 45 lb. per acre and

50-60 lb. of superphosphate per acre can be recommended for erosion control.

TABLE 25.—TRIALS WITH RYE—RATE OF SEEDING AND SUPERPHOSPHATE TRIALS.

Average Four Years, 1944-47.

Treatment.	Yield.	
<i>Rate of Seeding Section.</i>		
	Hay cwt./ac.	Grain bus./ac.
Seed 15 lb. per acre ..	13.6	6.3
Seed 30 lb. per acre ..	14.8	7.1
Seed 45 lb. per acre ..	15.6	7.4
Seed 60 lb. per acre ..	15.8	7.6
<i>Superphosphate Section.</i>		
No manure	14.8	6.8
Superphosphate 30 lb. per acre ..	16.0	7.4
Superphosphate 60 lb. per acre ..	17.4	8.0
Superphosphate 90 lb. per acre ..	17.1	8.0

OTHER CROPS

Field Peas

Where peas can be grown satisfactorily they provide a useful crop which can be harvested for grain or used as a fodder, either as a green crop or after maturity. Like other legumes, they are of value in building up the nitrogen in the soil.

The tests at this Station have been for grain only, and, in addition to obtaining information regarding the yielding ability of standard varieties; they have included



Two-course rotations under trial at Walpeup.

the testing of crossbreds and new varieties, many of which have come from overseas. This latter work is being done in co-operation with the Melbourne University School of Agriculture.

During the last nine years, the period that peas have been tested, the plants failed to set seed in the three dry years, namely, 1940, 1943, and 1944. The average yields of the named varieties tested are as follow :—

Variety.		Average Yield, Seven Years.	Average Yield, Six Years.	Average Yield, Five Years.
		bus./ac.	bus./ac.	bus./ac.
White Brunswick	..	8.6	8.1	9.0
Dun	..	7.8	..	8.1
Collegian	..	..	8.3	8.4

Dun, the variety most commonly grown in Victoria, is later in maturity than either White Brunswick or Collegian.

The yields of pea plots have been lower each year than wheat plots in the same paddock. It has been found that the yield of peas is approximately half that

of wheat sown under similar conditions. Peas do not have the same suppressive effect on weeds as do cereals, and, in most years the peas have serious competition from mustard, and harvesting is thus made more difficult.

Oil-seed Crops

During and since the war there has been an acute shortage of vegetable oils of all types. Since 1941, observations have been made with respect to two types of oil-seed crops—linseed and safflower.

Test plots of linseed were sown during the years 1941-45 to obtain information regarding the yields obtainable in the Mallee, which is drier than the linseed areas of other countries.

The experience has been that linseed is unable to compete with weeds which cereals would normally suppress. Linseed in the plots was practically crowded out by mustard and other weeds in the spring, while plots of Rance 4H wheat in the same section kept above the weeds, and matured quite a good crop. In 1941, the Rance 4H check yielded 22 bushels, while the best yield obtained from linseed was 4 bushels. In 1943, the comparison was wheat 26 bushels and linseed 6 bushels, while, in 1944 and 1945, the linseed was a failure and the wheat yielded 6 and

15 bushels respectively. The varieties of linseed that gave the highest yields were Walsh and two strains from Uruguay.

Safflower, which produces an oil that can be used as a substitute for linseed oil as a paint oil, has given promising yields in the cereal districts of South Australia. It was sown in rows at the Mallee Research Station in 1946 and 1947. This year, drill-sown observation plots have been included. The early growth of safflower is slower than that of cereals and it appears doubtful if it will compete successfully with the annual cruciferous weeds.

CROP ROTATION TESTS

During the early years of wheatgrowing in the Mallee, intensive cropping with wheat was undertaken and stubbles were burnt to destroy Mallee shoots. Very few, if any, sheep were carried on the farms and the necessity to sow fodder crops for sheep or to leave land out to grass did not exist. However, the need of some system of crop rotation to maintain soil fertility and protect the soil from wind erosion, was recognized. It soon became evident that the production of wheat under the low rainfall conditions experienced was uncertain unless fallowing was practised.

To obtain more definite information as to the effect of crop rotation on the yield of cereals, and soil fertility, a permanent rotation trial has been commenced in Field No. 1. This trial consists of thirteen

rotations, two, three, and four course, replicated four times. The rotations are as follow :—

Two course—

Wheat, fallow.

Wheat, oats grazed till October then scarified.

Wheat, oats grazed till late summer then scarified.

Three course—

Wheat, oats grazed, fallow.

Wheat, barley, fallow.

Wheat, wheat, fallow.

Wheat, oats for hay, fallow.

Wheat, pasture, fallow.

Wheat, oats for grain, fallow.

Four course—

Wheat, oats for hay, oats fed off, fallow.

Wheat, oats for hay, pasture, fallow.

Wheat, pasture, pasture, fallow.

Barley, fallow, oats for hay, fallow.

In addition to the comparative returns obtained from the various rotations, a survey is made from time to time to determine the incidence of foot-rots, take-all, flag smut, sand drift, and other factors such as grain quality which may be influenced by any particular rotation.

The paddock in which these trials are located was set aside for this purpose at the establishment of the Station. Prior to clearing, opportunity was taken to carry out an exact survey of the timber and vegetation, and a soil survey of the area was made.



General view of rotation field at the Mallee Research Station.



Rotation plots fenced for grazing.

The paddock was cleared in 1932, sown to wheat in 1933, oats in 1934, fallowed in 1935, and sown on the present plot layout in 1936. In order to test the uniformity of the soil, the bulk wheat crop in 1933 was cut into numerous blocks and harvested as a uniformity trial. In 1936, as all the plots were sown under the same conditions, and located on the sites for the permanent experiment, opportunity was again taken to test the natural variation of the soil.

The main comparisons which can be made in the limited period to date are as follow :—

In the two-course rotations there is no difference in the average yields obtained from wheat grown on cover-cropped fallow, and wheat grown on land sown to oats and grazed until October then short fallowed. However, in those plots where cultivation of the area sown to oats for grazing was delayed until late summer the yield of the subsequent wheat crop has been decreased by 2 bushels per acre.

There is no significant difference in the yield of wheat between any of the three-course rotations tested. In the four-course rotations the series wheat, pasture, pasture, fallow has given slightly higher yields of wheat than the wheat, oats for hay,

pasture, fallow or wheat, oats for hay, oats fed off, fallow rotations. These two latter rotations do, however, provide considerably more stock feed than the other four-course rotation.

Results obtained to date are not sufficient to make accurate comparisons between the two-, three-, and four-course rotations, but the average yield of wheat from all the three-course rotations is approximately 2 bushels per acre less than that from the four-course rotations.

The rotation field also provides a comparison between the yields of crops grown on fallow and those on stubble for wheat, barley, and oats for hay. In each case the average yield over the past eight years of the crop grown on fallow is approximately twice that harvested from stubble land.

A further series of rotation plots was laid down in 1946. The object of these is to compare, in larger plots, the effect of leaving land out to grass for a period. The plots are much larger than those in Field No. 1, and it is hoped to make valuable observations on the incidence of soil drift on land so spelled compared with land cropped on a two-course rotation.

The rotations in this trial are :—

- (a) Two course—fallow, wheat.
- (b) Four course—fallow, wheat, pasture, pasture.

The pastures in both series of rotation trials comprise natural volunteer pasture species.

CULTIVATION TRIALS

Cultivation trials were commenced at Walpeup in 1933, the following cultivation systems being tested in duplicate plots :—

- (a) Deep fallow, ploughed 5 inches, mid-July, cultivated and sheeped in standard manner.
- (b) Normal fallow, ploughed $2\frac{1}{2}$ inches, mid-July, cultivated and sheeped in standard manner.
- (c) Late fallow, ploughed $2\frac{1}{2}$ inches, late September, cultivated and sheeped in standard manner.
- (d) Sheeped fallow, ploughed $2\frac{1}{2}$ inches, mid-July, not cultivated till autumn.
- (e) Neglected fallow, ploughed $2\frac{1}{2}$ inches, mid-July, neither cultivated nor sheeped (abandoned after three years.)
- (f) Non-fallow, ploughed just before seeding.

The results of the trials for nine years, which include the results obtained from a special series of drift control cultivation trials conducted during the three years 1940-42, are given in Table 26.

TABLE 26.—WHEAT CULTIVATION TRIALS.
Average Results, Nine Years, 1934-42.

Treatment.					Yield.
					bus./ac.
Deep fallow	..	..	..	..	19.9
Normal fallow	..	..	..	..	19.1
Late fallow	..	..	..	..	18.4
Sheeped fallow	..	..	..	..	17.4
Non-fallow	..	..	..	..	13.2

These plots were sown at the normal seeding time with seed at the rate of 60 lb. per acre and superphosphate at 90 lb. per acre.

In each year a certain amount of soil drifting, due to high winds, took place.

It will be seen from a study of Table 26 that the highest average yields have been obtained from the deep fallow plots. This is attributed partly to the fact that, under some conditions, the immediate effects of drifting were less serious on deep than on normal fallow. It would appear, however, that deep ploughing results in less erosion than shallow ploughing only when it succeeds in bringing cloddy or clayey material to the surface.

The yield from the late fallow plots is higher than results of similar experiments at other centres would lead one to expect, and should not be taken as a justification of late fallowing. It is pointed out that weed growth on the plots was rigidly suppressed by sheep prior to ploughing, and to an extent which may not be possible or practicable over large areas on the average farm.

It was noticed also, that, when even light land was broken up later in the season, it remained rougher and less liable to drift in the summer months than normally cultivated fallow.

It sometimes happens, if fallowing is delayed till after the winter, that the

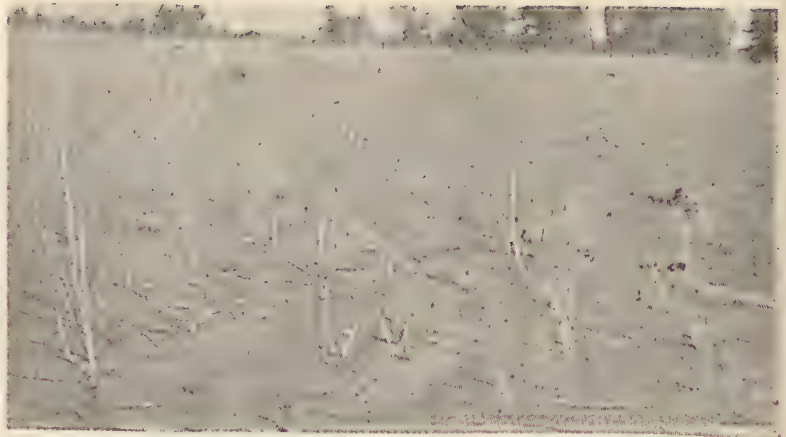


First working of a fallow. (Left) With a scarifier. (Right) With a plough.

soil becomes too hard to plough effectively, and the operation has to be delayed until the autumn rains. When this happens, every effort should be made to graze the area as heavily as possible in order to keep weed growth to a minimum. By so doing, the loss in yield of the subsequent crop, due to late fallowing, is minimized. In 1938, the late fallowed plots could not be ploughed until March of the following year. Nevertheless, this short fallow period gave an increase of 4·9 bushels per acre over the non-fallow treatment in the 1939 crop.

The high average yield from the non-fallow treatment, and, to some extent, from the late fallow plots, is attributed to the fact that, in some of the years, the plots were located on newly-cleared land where weeds were not troublesome. In 1937, the neglected fallow (neither cultivated nor sheeped) treatment was abandoned, but the comparative results between this and normal fallow, over the three-year period, 1934-36, show the average reduction in yield, due to complete neglect of the fallow, to be 10·8 bushels per acre. During the same period, the average yield from the sheeped, but not fallowed, plots was 7·1 bushels below that from the normal fallow, so demonstrating that, if a fallow becomes over-grown with weeds, the usual benefits of fallowing are lost. That sheep cannot wholly replace the cultivator on the fallow is shown by the average yield of the sheeped-fallow plot, which is 1·7 bushels per acre less than that from normal fallow in the above tests and 3·1 bushels per acre lower in the results shown in Table 27.

The above trials were concluded in 1942, and additional cultivation trials have been laid down on permanent sites. These trials are replicated and embody eight fallow treatments, viz., deep, normal, intensely worked, late, sheeped, scarified, non-fallow (not ploughed up stubble land), and a treatment in which weeds are controlled till October by means of a scarifier, the area



Cover crop fallow at the end of summer. The grazed stubble has prevented the soil from drifting.

being ploughed as a last cultural operation before the summer.

The results of this trial in the past eight years are shown in Table 27.

TABLE 27.—PERMANENT CULTIVATION TRIALS.

Average Results, Eight Years, 1940-47.

Treatment.	Yield, bus./ac.
Intensely-worked fallow	16·4
Deep fallow	16·3
Fallow scarified early, ploughed late ..	15·8
Normal fallow	15·7
Ploughless (scarifier) fallow	15·0
Late fallow (October)	13·4
Sheeped fallow	12·6
Non-fallow	9·0

The above results confirm those from the earlier test shown in Table 26. The treatment in which the fallow is intensely worked, that is, cultivated after every worthwhile rain, has returned the highest average yield of wheat. The treatment in which a scarifier was used instead of a plough for the first working and ploughing as a last working before the summer, was introduced as a drift control measure. The early working keeps the weeds under control, and the late ploughing tends to leave the soil rough over the summer. Yields under this treatment have been very satisfactory, but, while useful in reducing drift, its use is limited to comparatively small areas.

In 1936, a test was introduced in order to determine the effect on yield of sowing a cereal crop in the spring, on land which has been fallowed and treated in the normal manner up to this time. The crop, which is sown at about 40 lb. of seed per acre late in August or early September, depending on rains, is grazed down after the plants have become firmly established, and the roots and remaining stalks are expected to hold the soil till after the summer when the land again worked and sown in the usual way. The results of the test are given in Table 28. Although cover crops were sown in these plots in 1938, germination and growth were so poor that no results are available for the treatment in 1939.

TABLE 28.—EFFECT OF COVER CROP.

	Wheat Yield in Bushels per Acre. Average Yields, Six Years, 1937-38, 1940-43.
Bare fallow	18.2
Cover crop fallow (oats) ..	16.9

It will be noted that, during the six years of test, the cover crop caused an average reduction in wheat yield of 1.3 bushels per acre. In comparing these treatments it is necessary to offset the value of the feed obtained from the cover crop against the reduction of the wheat yield.

The question of what plant is best to sow for cover crop has been investigated. Cereals have been found to be more effective than peas, rape, millet, or Sudan grass. Oats were found to have the least depressing effect on the subsequent yield of wheat (see Table 29).

The grazing management of the cover crop is most important. Undergrazing results in a good growth of cover crop and an effective erosion control at the expense of soil moisture, and, ultimately, of the wheat yield; while overgrazing defeats the purpose of sowing the cover crop.

TABLE 29.—YIELD OF WHEAT FOLLOWING DIFFERENT COVER CROPS.

Average Yield of Three Years, 1940-42.

Wheat after—	Yield. bus./ac.
Cover crop of oats	15.3
Cover crop of rye	14.9
Cover crop of wheat	14.9
Cover crop of barley	14.5
Cover crop of oats, but not grazed till late in growing period	14.4

The results of the cultivation trials above, and general observations, show clearly that crops sown on fallowed land in the Mallee return much higher yields than those on non-fallow or stubble land. In general, fallows which are prepared early and are well cultivated throughout the year, return the highest yields. However, frequent cultivation is often a predisposing cause of soil drift, and because of the readiness with which Mallee lands may drift when bare-fallowed in the normal way, some modification of this practice is often necessary.

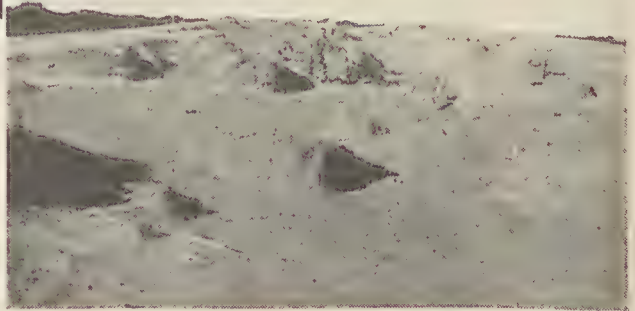
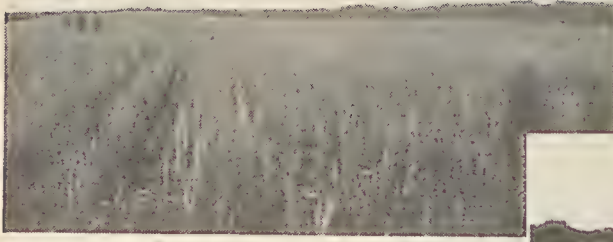
In 1946, a fallow modification trial was commenced with a view to testing the effect on the incidence of soil drift, and on the yield of the subsequent wheat crop, various fallow treatments which should reduce drift.

The plots in this trial are each approximately $\frac{1}{2}$ acre in area, each treatment being replicated three times. As the effect of a treatment over a long period of years may be important, these plots are located on permanent sites. They are worked on a two-course rotation and the stubbles are not burnt. The following treatments are being tested.

- (1) Normal winter bare-fallow.
- (2) Oats sown in the stubble, grazed until the spring, then bare-fallowed.
- (3) Oats sown in the stubble, grazed until the summer, and then fallowed.
- (4) Winter fallow sown with a cover crop of oats late in August.
- (5) Winter fallow as No. 1 but straw maintained on the surface as a mulch.
- (6) Non-fallowed. Not ploughed or cultivated (but grazed) until the autumn.

Left.—A sandhill stabilized with rye-corn.

Below.—The same hill prior to levelling and seeding with rye.



In addition to observations on soil drift and measurements of yield, these plots are soil sampled each year to provide technical information in regard to moisture conservation and nitrate development under varying conditions of cultivation.

SAND DRIFT CONTROL

The prevention or control of soil erosion is bound up with the correct use of land. Almost since the inception of the Station the matter of sand drift has received attention, and the investigations at Walpeup have contributed materially to our present knowledge of control methods.

The cultivation trials described above have supplied information both in regard to a comparison of wheat yields which can be expected after certain cultivation treatments and also to the liability of the land to drift when so prepared. The pasture investigations, rotations, grazing, stock feeding experiments and other trials and observations enable recommendations to be put forward which, if adopted, should greatly reduce sand drift.

Control Measures on Cultivated Land

One or more of the following may be used:—

(a) The sowing on the fallow of a spring crop which, after light grazing, is sufficient to hold the soil from drifting and also to arrest the passage of sand through it.

(b) Leaving the fallow as rough as possible through the summer, which may be achieved by mould-board ploughing as the last spring operation, before which the area is either very heavily sheeped or lightly cultivated

to prevent the growth, and particularly the seeding, of weeds.

(c) Avoid excessive cultivation of the fallow and particularly dry working.

(d) Where straw is present to an appreciable extent, the maintenance of it on the surface to hold mechanically the soil from drifting, such to be obtained by the use of the scarifier or disc implement instead of the plough.

(e) The ridging (listering) of fallows, either shallowly or deeply, is useful for a short time, but offers no real solution to the problem of sand drift. In some cases, however, this is the only treatment which can be applied on both cultivated and non-cultivated lands. If cloddy material can be raised so much the better. On land where the surface mulch has blown away furrows serve to catch soil from adjoining areas, and, by so doing, improve the condition of the soil for seeding.

(f) Adopt different cultivation treatment on "drifty" areas. Flats may be fallowed in the ordinary way, and the hills and lighter parts of the paddock fallowed later, or cover-cropped.

(g) Sandhills are sometimes neglected because they are too "heavy" for the tractor. Unless sown, the hills may deteriorate and act as focal points for the spread of erosion.

(h) Grazing instead of ploughing. On very "drifty" areas fallowing could be eliminated altogether and the area sown with a cereal, preferably oats or rye, and grazed until the autumn, and then cultivated in readiness for the wheat crop. If overgrazed, such land will drift just as badly as does normal fallow.

(i) Avoid working implements, particularly disc implements at high speeds.

(j) Do not hold sheep on the fallow after they have cleaned up weeds and other growth.

Of the methods tested, that involving the use of a cover crop was the most effective in preventing the soil from drifting, and the drift on the areas so treated was negligible. In drought years, difficulty may be encountered in establishing a cover crop in the spring. This is the chief disadvantage of this method of control.

On one series of the cultivation trials, treatments on burnt and unburnt wheaten-stubble areas were introduced. Close observation and measurements of the amount of drift on the different plots confirmed the advantages of ploughing in the stubble as a drift-control measure, instead of burning it. Also, another series of plots was started last year to further compare fallow on land where stubble has been burnt as against unburnt. The comparisons are to include liability to drift, disease incidence, effect on yield, and the effect on the organic material of the soil.

Control Measures on Non-cultivated Land

The chief points for erosion control on land which is not under cultivation are as follows:—

(a) Avoid overstocking. As far as practicable grazing should be managed to ensure that sufficient cover is maintained on the soil to prevent erosion.

(b) If, for any reason, the land does not develop sufficient herbage to protect the soil, such land should be cultivated and sown with a cereal crop.

(c) Early attention when bare patches begin to appear on sandhills or elsewhere in the paddock is desirable. These patches act as focal points for the spread of erosion. Straw or stable manure on bare patches, or cultivation and sowing may prevent further damage.

Rye has been found to be the most suitable cereal for growing on loose sand banks or hills depleted of surface soil and fertility by wind erosion. Even in cultivation paddocks which are to be left out to grass for a short term, it is desirable that the "scalded" patches should be cultivated and sown to rye.

The blowing of sandhills which have been denuded of vegetative cover by overgrazing or other means is a very serious form of erosion in the northern Mallee. If attention is not given to these hills, they soon become either "razorbacks" or "weeping ridges" which cannot be worked by ordinary implements. This type of erosion is commonly found on land that has not been worked for several years, and causes serious and constant trouble to public utilities such as roads, railways, and stock and domestic water channels.

To demonstrate a method of stabilizing such hills, the Research Station, in co-operation with farmers in various parts of the Mallee, initiated a series of demonstration areas in 1945. The sites of these trials were at Danyo, Torrita, Ouyen, Lascelles, and Walpeup. Farmers who co-operated were Messrs. A. J. Wyatt, J. A. Pryse, J. A. Steele, and S. R. Pearse, while the work at Walpeup was done in co-operation with the Soil Conservation Board.

The preliminary work on each site before sowing, consisted of ploughing up exposed hard patches or limestone areas where necessary, the levelling of the hilltops insofar as was practicable, and removing of stumps exposed by loss of topsoil. The whole area was then sown to rye. A standard seeding rate of 45 lb. of rye per acre was adopted, while a dressing of 50 lb. of superphosphate was used on the bulk of the area, but some strips were left without superphosphate. In all cases, the response to superphosphate on the demonstration areas was obvious, and was measured by sample harvesting. Other tests conducted at the Research Station indicate that a seeding rate of 45 lb. of rye and 50-60 lb. of superphosphate per acre can be recommended for erosion control (see Table 25).

The demonstrations showed that it is possible to establish rye on eroded soils where previously it was considered doubtful



The left hand picture illustrates the difference in early growth of rye and oats. Left, rye ; Right, oats.

Lower,—Rate of seeding trial with rye. Left, 15 lb. per acre ; Right, 60 lb. per acre.



if vegetation could be supported, and also that the formation of sharp ridges can be halted by the establishment of cover on the sides of the ridges. The top will then blow and accumulate in the cover on the sides, thus reducing their height, and making it possible for the tops to be sown in a subsequent season.

Technical Studies on Drift

The physical condition of the surface soil is of considerable importance in determining the readiness with which a soil will drift and a number of factors, both chemical and mechanical, which affect the physical condition of the soil have been studied.

In addition to determining the amount of drift which takes place when the land is subjected to various cultivation practices, and the efficacy of possible drift control measures, considerable attention is given to technical aspects of wind erosion. This involves studies of the relationship between atmospheric conditions and dust storms, amount and nature of eroding material, rate of erosion on normally-cropped areas, and its effect on soil fertility. The value of shelter belts in reducing wind erosion has also been investigated.

The nature of the technical studies involves their continuance over a number of years to enable conclusions to be reached. Though not spectacular, they are concerned with the fundamental causes of wind erosion, and as such are an essential feature of the investigations. The continuity of this work was interrupted during the war period.

Offers by district farmers to co-operate with the staff of the Station by allowing access to their properties throughout the year and particularly during the fallowing period are appreciated, and many visits have been made. In this way, much useful information is obtained regarding the various fallowing modifications being used and tested under a wider range of conditions than is possible on the Mallee Research Station.

Boundary Control Methods

The control methods outlined above aim at preventing drift at its source. In order to protect essential services—roads, railways, or channels—boundary control methods are often used. The most common of these is to leave an uncultivated strip of land or easement on the windward side of the area to be protected. If such an area is grazed hard, the sand will blow across the smooth surface. Deep furrows on the easement will assist temporarily in trapping the sand, or crops may be sown to ensure that there is some growth to make the easement effective. Tests at this Station have shown that, in some years, 1 chain of fairly thick growth is insufficient to trap all the sand from a paddock 30 chains

(continued on page 480.)

CERTIFIED PULLORUM-TESTED FLOCKS (POULTRY)

A certified Pullorum-Tested Flock is one in which all stock over six months of age have given a negative reaction to the agglutination test for Pullorum Disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector.

The undermentioned flocks have been certified by the Department of Agriculture, and will remain so for the current calendar year, or until such time as the Chief Veterinary Inspector determines.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Particulars of breeds of birds tested are as shown hereunder:—

A. Australorp; B. White Leghorn; C. Rhode Island Red; D. Sussex; E. Langshan; F. Brown Leghorn; G. Buff Orpington; H. Black Leghorn; I. Minorca; J. Ancona.

Owner.	Breed.	Number of Birds.	Owner.	Breed.	Number of Birds.
Agricultural College, Dookie ..	A, B	2,120	Ford, J. V., 11 Barkers-avenue, Shepparton	A, B, C	997
Anderson, G., Greensborough-road, Macleod ..	A	1,409	Fraser, R. A., Colchester-road, Kilsyth ..	A, B, C	1,185
Andrew, C. S., Longlands-road, Mitcham ..	B, E	496	Frye, I. H., Grimshaw-road, Watsonia ..	A, B	1,996
Anguey, H., Hargrave-street, Castlemaine ..	A	775	Fullerton, G. H., 57 Just Point, Long Gully, Bendigo	A, B, C	344
Arnold, J. B., Terrara-road, Vermont ..	A	713	Gedye Bros., Railway-road, Blackburn ..	A, B	4,594
Ashgrove Stud Poultry Farm, Cockatoo ..	A, B, C	4,427	Giarrusso, G., Braeside ..	B	801
Avonlea Poultry Farm, A. E. Gibbs, Prop., Stanhope ..	A, B	3,981	Gibbs, J. L., Main-road, Lower Plenty ..	A, B	748
Baker, J. V., Albion-crescent, Greensborough ..	A	699	Graham, C., "All Black Poultry Farm," Portarlington	A	60
Bantick, K., Old Dandenong-road, Heatherton	A, B	2,375	Greenham, D. J., Canterbury-road, Ringwood	A, B	906
Barstoc Experimental Farm, P.O., Croydon	A, B	1,376	Grenville, G. W., Springvale-road, Springvale	A, B, C	3,327
Barnes, Mrs. A., The Heights Poultry Farm, Blackburn-road, Blackburn	A, B, C	3,323	Grosvenor, E. W., and E. K., "The Haven Poultry Farm," Springvale	A, B, C	566
Bartlett, N. M., Pimpino ..	A, B	264	Guy, C. J., "Murlea," Murgheboluc ..	A, B, C	557
Bastin, W., Banbury-road, Reservoir ..	A, B	1,278	Gwyther, R. P., Highton ..	B	1,220
Bassett, R. A., South Muckleford ..	B	401	Hall, R. H., Wal Wal ..	A, B	857
Batey, F. A., Katandra North ..	A	141	Hall, W. S., Cairns-road, Lyndhurst ..	A, B, C	1,081
Batey, L. J., Katandra North ..	B	887	Hamblin, N. A., "Sunny Hill Poultry Farm," Toolleen	A, B	2,905
Batey, R. F., Invergordon South, via Tallygaroopna	A	1,599	Hamilton, W. J., Wood-street, Stawell ..	A, B	945
Bayfield, A. E., Westall-road, Spring Vale ..	B, C	1,381	Hanson, S. H., Box 7, Kilmore ..	A	206
Beets, L. J., Moolap ..	B	939	Hardie, F. A., "Mecla," Parker-avenue, Boronia	C	62
Billman, J. H., Skene-street, Bendigo ..	A, B, C	742	Harrington, W. H., 179 Woodward-street, Golden Square	A, B, C	1,764
Bingley, A., 333 Highbury-road, Burwood ..	A, B	2,062	Harrison, Mrs. A., Shenfield-street, Cobden	A, B	247
Bishop, Mrs. P. M., Springvale-road, Springvale South	A, B, C	1,601	Jayes Bros., Mt. Dandenong-road, Montrose	A, B	2,651
Boyce, A. D., Springvale-road, Forest Hill	B	2,139	Hemphill, A. E., Monetta ..	A, B	522
Bray, J., 18 Hotham-street, Warrnambool	B	96	Henderson, C. W., "Clifton," Shepparton East	A	462
Broom, S. G., Scott-street, Vermont ..	B	366	Henderson, W. R., 22 Chesterville-road, Cheltenham	A, I	228
Brumby, W. E., Ellendale-road, Noble Park	A, C	402	Hewett, A., Central-avenue, Bayswater ..	B, C	1,415
Burke, J. F., Grimshaw-street, Watsonia ..	A, B, C	1,491	Hewitt's Poultry Farm, Skene-street, Bendigo	A, B, C	1,374
Calder, R. A., Langwarrin ..	A, B	1,135	Hines, B., Box 80, Donald	B	425
Canning, P. G., Shepparton East ..	B	3,974	Hines, W., Traynor's Lagoon, via St. Arnaud	B	345
Carlella, Poultry Farm (J. A. Stoneman), Campbell's-road, Briar Hill	C, F	276	Hooker, Mrs. E. L., Cr. Heatherton and Westall roads, Springvale	A, B, C	957
Cashin's Poultry Farm, Stawell ..	A, B	3,860	Howard, A. P., Brookville, Kyneton ..	A, B	1,273
Chapman, Mrs. E. E., Youanmitte ..	A	253	Hunt, R. R., 365 Highbury-road, Burwood	A, B	1,197
Christie and Son, Tucker-road, Bentleigh ..	A, B, C	1,146	Hurst, Mrs. B. H. G., New-street, Eltham	B	1,636
Clark, H. N., Bayswater-road, Croydon ..	A, B	4,871	Inglis, W., Cobham-road, Mitcham ..	A, B	459
Clements, Wm. H., 7 Crown-road, Ivanhoe, N.21	B, C	60	Jackson, Miss E. M., 4 Monash-street, Box Hill	B	52
Coakes, G., Central-avenue, Bayswater ..	B	352	Jenkins, A. E., Pen-y-bryn, Kallista ..	C	1,076
Collins, A. J., Old Beaconsfield-road, Emerald	A, B	473	Johnson, A., Sunray-avenue, Cheltenham ..	B	651
Colquhoun, W. L., "Aringa," Ringwood ..	A, B	146	Johnson, A. S., Burwood-road, Lower Fern-tree Gully	A, B, C	2,424
Cook and McNight, Croydon North ..	A, B	1,354	Jones, A. G., Shepparton ..	A, B	402
Corbett Bros., Torbay-road, Macleod ..	A	2,458	Kay, V., 12 Wellington-avenue, Blackburn	B	2,776
Crowle, L. Z., "Monomeeth" Broadford ..	A, B	900	Kemp, H. L., Whitehorse-road, Ringwood	A, B, C, D	2,465
Cumming, H. D., "Jellalabad" Darlington	A	58	Kerr, J. J., Clarke-road, Springvale ..	A, B	2,319
Davey, A. R., Sellars-street, Greensborough	A, B	1,271	Lang, J., 46 Dundas-street, Thornbury ..	E	124
Davidson and O'Keefe, 22 Sherbrooke-avenue, Ringwood	A, B	144	Lawson, A. J., Box 167, Horsham ..	A, B	416
Davies, L. F., off Westall-road, Springvale	B, C	2,198	Lecthe Bros., "Dondardon Poultry Farm," Mt. Waverley	B	1,485
Dawson, R., Maldon-road, Castlemaine ..	B	1,586	Lintermans, Messrs. W. A. J. and Son, Major-road, Lysterfield	C	879
Day, L., Kyvalley ..	A, B, C	1,717	Londe, R. A., 1 Chanak-avenue, East Malvern, S.E.5	B	38
De Gruchy, Mrs. F., 56 Kingsville-street, West Footscray	C	45	Longerenong Agricultural College, Doon ..	B	372
Dent, A. T., "Rldgeway," Sellars-street, Greensborough	A, B	1,178	Lowe, G., "Blackwood Dell," Lillico ..	A, B, C, J	361
Dobson, C. W., Whittlesea ..	C	108	Lucas, G., 4 Downing-street, Blackburn ..	A, B	1,967
Dyson, F., Post Office, Mooroopna ..	A, B, C	744			
Emmott, J. T., Verdon-street, Inglewood ..	A, B, C	314			
Everard, H. L., Hawkesdale ..	A, B, C	924			
Fellows, J., Yan Yean-road, Plenty ..	A, B, C	521			
Fitchett, C. W., Springvale-road, Tally Ho	B	2,996			

CERTIFIED PULLORUM-TESTED FLOCKS (POULTRY)—continued.

Owner.	Breed.	Number of Birds.	Owner.	Breed.	Number of Birds.
Magnusson, L., Nathalia ..	B	952	Salmond, J. B., Deer Park ..	H	230
Maher, Allan E., "Alandale," Wai Wai ..	B	748	San Miguel, A. S., Woodhouse-grove, Box Hill ..	A, B	2,210
Major, C. D., Simpson's-road, Eaglehawk ..	A, B	2,021	Scales, J., West Wattle-tree-road, Boronia ..	A	1,382
Marshall, A. R., Archie's Creek ..	A, B, C	936	Schulze, Mrs. C. A., Box 52, Dimboola ..	A, B	200
Mayne, N., Brandy Creek-road, Warragul ..	A, B	77	Scouler, R. C., Tarrant-street, Cobden ..	A, B	489
McCabe, R., Gladstone-road, Dandenong ..	A, B	2,168	Settle, J. H., Stanhope ..	A, B, C	1,484
McCann, Messrs. R. and Son, Crowlands-road, Stawell ..	B	3,456	Simmons, J. T., 6 Lindsay-avenue, Murrumbidgee ..	B	29
McErvale, P. A., Kingclare Poultry Farm ..	A, B	2,874	Simpson, G. D., May-road, Glen Waverley ..	B	7,106
Boronla-road, Vermont ..			Smith, A. H., Marong-road, Maiden Gully ..	A, B, C	1,100
McLaren, A. D., Mooropna ..	A, B, C	369	Smith, W. T., and F. W., Panton Hills ..	A, B	1,832
McLauchlan, D. F., Rossiter-road, Koo-wee-rup ..	A, B	2,147	Snodgrass, R., Pakenham East ..	B	1,015
McNamara, L., Sherbrooke Hatchery, 49 Whitehorse-road, Ringwood ..	A, B, C	546	Stant, Messrs. W. J., and F. E., Springvale Chick Service, Westall-road, Springvale ..	A, B, C	3,996
McNamara, O. J., 24 Sherbrooke-avenue, Ringwood ..	A, B, C	1,716	State Research Farm, Werribee ..	A, B	903
McVay, A., Kernot-street, West Footscray ..	A, B	2,681	Statham, S. B., 16 Inglewood-road, St. Arnaud ..	A	688
Mead, J. L., 28 Golf Links-road, Oakleigh ..	A, B	317	Stewart, J. A., Maldon-road, Castlemaine ..	A, B	520
Meier, C. G., "Bylands," Sydney-road, Kilmore ..	A, D	40	Stewart, P. D., Bayswater-road, Croydon ..	A, B	987
Merrett, A. W., Albert-street, Sebastopol ..	A, B, C	239	Stiles Bros., "Fairview," Wallan ..	B	871
Milligan, V. R., State School, Ballendella ..	B	35	Streeter, H. A., Avoca ..	B	544
Milner, Messrs. T. and Son, Austin-crescent, Pascoe Vale ..	A, B, E	2,800	Success Poultry Farm, 13 Knight-street, Shepparton (C. Hopkins, Proprietor) ..	A, B, C	1,362
Molson's White Leghorn Stud (H. Durkin, Manager), 188 Surrey-road, Blackburn ..	B	1,089	Sutherland, J. M., Fulton-road, Box Hill ..	B	493
Monsant, J., Maiden Gully, via Bendigo ..	A	1,557	Swift, D. A., Kangaroo Flat ..	A, B	2,468
Moore, H. A., Warrandyte-road, Ringwood North ..	A, B	1,062	Taylor, R. H., Rathgowen-road, Reservoir ..	A, B	2,096
Moran, S. G., Glenburnie-road, Mitcham ..	A, B	655	Teitz, G. J., 21 Kingsley-crescent, Mont Albert ..	A, B	391
Moroney, J. B., Kangaroo Flat ..	A, B	1,670	Thomson, G., Westell-road, Springvale ..	A, B	1,648
Mumford, L. J., Healesville ..	A	393	Trinca, M., Charming-street, Moorabbin ..	B	1,510
Nemet, P., Springvale-road, Springvale South ..	A, B, C	2,391	Voight, A. H., Follett-road, Cheltenham ..	A, B	1,154
Niewand, F. J., "Kalang," Lubeck ..	A, B, C	1,556	Waiting, T. F., Bayswater ..	A, B	1,288
Overman, V. C., Vernal-avenue, Mitcham ..	A, B	1,944	Wakeham, W. M., 20 Frederick-street, Heidelberg ..	A, C	50
Owen, H. T., Chum-road, Healesville ..	B	296	Walton, F. R., Woodvale-road, Boronia ..	A, C	724
Paton, W. S., Glenburnie-road, Mitcham ..	A, B	626	Wandong Poultry Farm, Lawn-road, Noble Park (M. E. Trembath) ..	A, B	1,284
Pitotti, C., Clarke-road, Spring Vale ..	A, B	2,961	Wanless, W. J., Springvale South ..	A, B	1,882
Poulton, A. W., Vickers-street, Sebastopol ..	A, B	1,875	Watson, W. K., Greenvale-road, Somerton ..	A, B	860
Rae, J., 277 Albert-street, Sebastopol, Ballarat ..	A, B, C	1,679	Waugh, A. J., Kangaroo Flat ..	A, B	1,202
Reher, F. L., Temple-street, Burwood ..	A, B, C	2,219	Webb, A. E. H., Frankston-road, Cranbourne ..	A, B	6,942
Roberts, Miss A., "Range View," Launching Place ..	B, C, D	106	Welsh, T. A., Bayswater-road, Croydon ..	A, B	4,512
Robinson, W., 11 Olive-street, Hampton, S.7 ..	C	471	Wernli, J. H., Wilson-street, Cheltenham ..	A, B, D	1,535
Rosebank Poultry Farm, 119 Rathgowan-road, Reservoir. (H. Taylor, proprietor.) ..	A, B, C	3,171	Wesley, J. H., Kangaroo Flat ..	A, B, C	1,810
Rossmoyne Poultry Farm, Box 38, Avoca ..	A, B	1,781	Wilkinson, L., McKenzie-road, Golden Square ..	A, B	369
			Wimhurst, J. C., Private Bag, Tongala ..	B	523
			Winter, G., "Denchurst," Murgheboluc ..	A, C	470
			Wohlers, S., Box 17, Jung ..	A	300
			Wright, D. E., South-avenue, Mt. Evelyn ..	C	64

MALLEE RESEARCH STATION (continued from page 478)

wide, but that 3 chains was satisfactory for at least one year. However, the sand collected on the easement is a potential danger for the future. Brush fences are used in some places for protection, while the Victorian Railways authorities have had success with wind-chutes to keep their lines clear of sand.

Boundary controls are temporary expedients only, and offer no real solution to the drift problem. Their efficacy for their special purpose depends on the quantity of sand they have to control. The most logical place to attempt sand drift control is on the areas where it originates.

A third and final instalment of this article will appear in a subsequent issue of the Journal.

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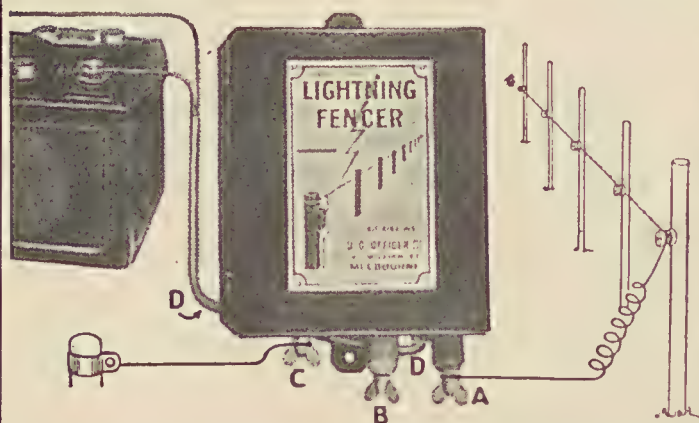
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By G. T. Thompson, A.M.I.E. (Aust.), Executive Officer, Soil Conservation Board,
and J. A. Morrow, B.Agr.Sc., Senior District Agricultural Officer

A cup for perpetual annual competition for the best effort at soil conservation by landholders within the Upper Murray Region has been presented by Mr. H. Hanslow, Commissioner of the State Rivers and Water Supply Commission. The area includes the Victorian catchment to the River Murray and its tributaries down to Yarrawonga, with the exception of the Omeo district.

In addition to holding the cup for the year, the winner receives a trophy from the Soil Conservation Board, which organized the competition.

The competition is intended to stimulate interest in soil conservation in the area. It will give landholders the opportunity to discuss problems of soil erosion on their properties with the judges, and will provide Departmental officers engaged on soil conservation with the opportunity to meet landholders who are concerned with erosion and are endeavouring to arrest its progress.

It is to be appreciated that the farmer who, by wise land use throughout his occupancy of a property, maintaining or improving the fertility of his soil, has done as good or a better job of soil conservation than one who has carried out soil erosion control measures required because of earlier ill-usage of the soil. Properties fitting into both categories competed this year.

Owing to the wide diversity in rainfall, topography and land usage, it was necessary in comparing one property with another to give careful consideration to the degree of erosion hazard existing in each particular district and on each individual property. This degree of hazard and the efforts made by the landholder to offset its possible effects, were the dominant factors in deciding on the winning property.

Geographic

The Upper Murray Region includes the whole of the Shires of Upper Murray, Towong, Bright, Yackandandah, Wodonga, Oxley,

Beechworth, Chiltern, Wangaratta, Rutherglen, and Yarrawonga. This territory comprises the catchments of the King, Ovens, and Kiewa rivers, the Mitta river excluding its upper reaches, and the River Murray in Victoria downstream to the Yarrawonga Weir. These boundaries were fixed to accord with the region as defined by the Central Planning Authority. Unfortunately, it excludes the Omeo-Benambra district, an extensive area of grazing country in the Hume Catchment where the erosion hazard is high.

Of the 6,905 square miles comprising the Region, an area of approximately 4,400 square miles is occupied farm lands. The remainder is largely mountainous country, and is retained as Crown Lands and Forest Reserves.

In addition to the important agricultural and timber production of the area, its preservation for catchment purposes is of paramount importance to the settlements further downstream.

The Region may be divided into two clearly marked sections with contrasting soil, climatic, topographical, and agricultural features. The two sections are roughly separated by the Hume Highway.

THE WESTERN SECTION

To the west of the Hume Highway the country is flat to undulating, with soil types varying from sandy loams to heavy clay loams, with some gravelly hills. The soils are mainly of alluvial origin, but, owing to the relatively light rainfall and the general flatness of the land, damage by erosion is not extensive.

In isolated parts on the steeper slopes, and where water has been concentrated by drainage or road construction, some severe damage has occurred.

Rainfall and Climate

The annual rainfall in the western section varies from about 18 inches at Yarrawonga to 25 inches in the foothills adjacent to the Hume Highway. The monthly incidence is fairly uniform, but the period of effective rainfall is from March to October. Summer rainfall occurs frequently as thunderstorms which are liable to cause erosion on bare, cultivated, or overgrazed rising ground.

Land Usage

Mixed farming with cereal growing and sheep raising is the main activity, although vineyards occupy a prominent position in the Rutherglen district.

Irrigation is practised by a few farmers and vigneron with properties adjoining the rivers, but no large-scale irrigation settlement exists within the Region.

Fruit growing is very limited, and dairying is practised only on a small scale.

Farming methods have changed considerably during the past twenty years, and, with the altered conditions, there have been changes in the liability of the soil to deteriorate through lowered fertility or erosion.

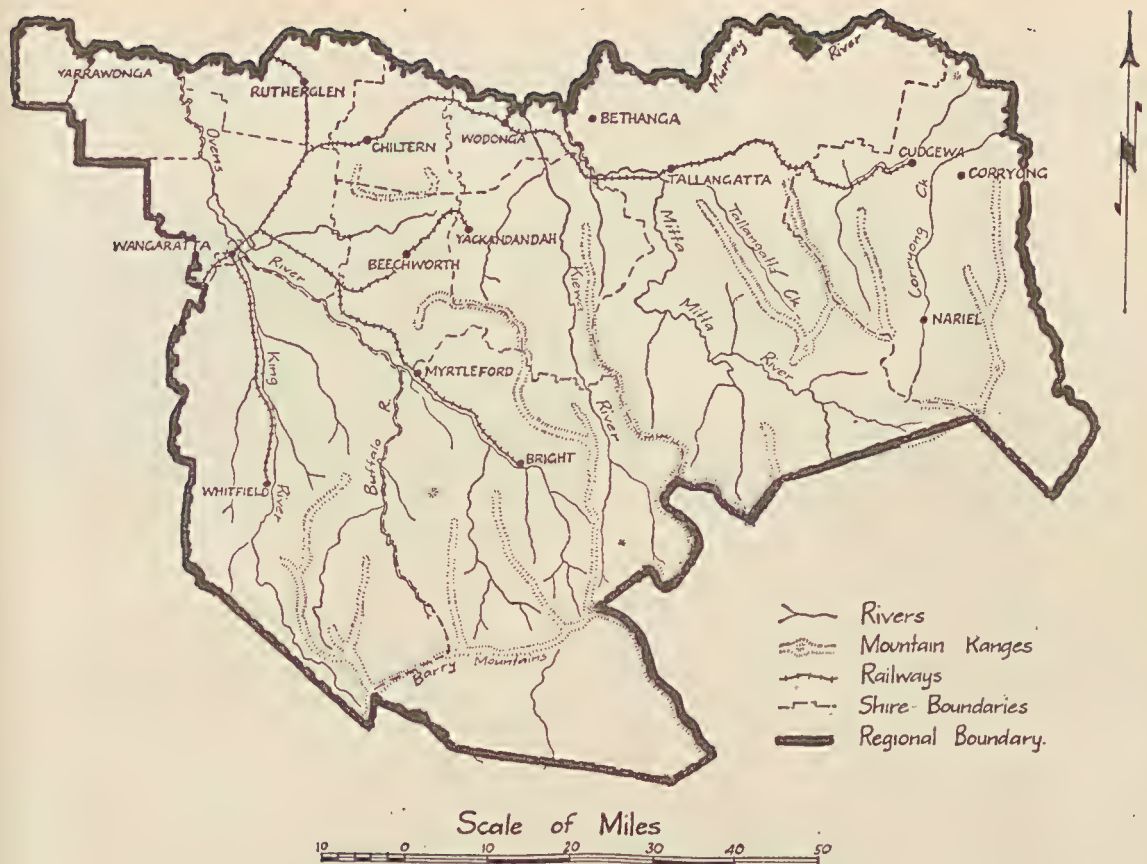
Prior to the introduction of subterranean clover and the development of improved pastures by topdressing with superphosphate, sheep carried were mainly of the fine-woolled Comeback type raised for wool production. With the improved pastures it became possible to raise fat lambs and fat-lamb production is now standard practice.

To a certain extent the development of improved pastures reacted unfavorably on the remainder of the farm. Many farmers were reluctant to plough up their highly-productive clover pastures and tended to divide their holdings into grazing and cropping paddocks. Some paddocks were overcropped and eventually became "worn out". In others, declining fertility was masked by the use of improved cereal varieties and more intensive methods of cultivation.

With the introduction of clover-ley farming the decline of soil fertility can be arrested and this, together with the reduction in the period during which the soil is exposed to the rains, has minimized the erosion hazard where this type of mixed farming is undertaken.

Subterranean clover has been responsible, not only for the restoration of fertility to large areas of overcropped land, but has given to the soil the capacity for better moisture absorption. Run-off has been reduced and by partial elimination of the vulnerable fallow period, soil movement has been checked and the land stabilised.

In the lower rainfall portion of the western section of the Region, subterranean clover does not occupy any considerable



part of the pastures, and clover-ley farming as practised in the Rutherglen, Wangaratta, and Springhurst districts, cannot be undertaken without considerable modifications. In the Yarrawonga district wheat grown on fallow is still standard practice, but the desirability of spelling the land for periods under pasture is becoming more widely recognized. Natural trefoils, if properly managed, can do much to improve the fertility of the soil.

Erosion

The necessity for fallow, and the relatively light pasture cover, has increased the vulnerability of the soils to erosion, and considerable gullyng has occurred on some of the sloping land.

effective farm land far beyond the cost of remedial treatment. Had preventive measures been taken when the gullying first became apparent, much valuable soil could have been saved.

In the early stages of erosion, control is frequently a very simple matter, and, provided sound methods are used, can be successfully undertaken on most farms. If neglected, small apparently insignificant gullies may quickly develop to a stage where the value and productive capacity of the farm are seriously impaired.

Serious erosion is occurring on land where a relatively low hazard has been increased by ill-considered cultivation and grazing practices. If the landholder has any doubts regarding the method of control to use he should avail himself of the advisory service given by the Soil Conservation Board or the Department of Agriculture.

THE EASTERN SECTION

The eastern section of the Upper Murray Region is mainly hilly to mountainous. It includes a large portion of the Victorian Alps and much rugged and precipitous country.

This area is the source of several important streams which, rising in the highlands, flow through fertile valleys and finally reach the River Murray within the Region.

The lower lands of this section consist of hilly country dissected by the valleys of the rivers and streams. In the lower reaches some of the valleys are wide, but generally they are confined to relatively narrow areas bounded by hills.

In the mountainous country the flow of the streams is rapid, but stream erosion has been resisted by the rocky nature of the beds and banks and by natural vegetation. When the agricultural country is reached and the rivers flow through the alluvial flats, there is a tendency to severe erosion, particularly where the protective vegetation has been removed from the banks.

The changing course of many streams has resulted in the destruction of large areas of once fertile flats. The hill country, consisting largely of soils derived from granitic and metamorphic formations, is also liable to severe erosion, and evidence of sheet erosion and gulying is appreciable. The damage has largely resulted from the effects of overgrazing, rabbits, bushfires, and overclearing.

On the other hand much of the country has been maintained in good condition by landholders who have seriously studied the maintenance of their properties despite the inherent erosion risk.

Rainfall and Climate

The rainfall varies from about 25 inches in the foothills near the Hume Highway, to over 60 inches in the mountainous country. The highlands, which include some of the highest peaks in Victoria rising to over 6,000 feet, are covered with snow during the winter months.

The incidence of the rainfall is satisfactory for the growth of perennial pasture species, and the effective growing period is somewhat longer than in the western half. Winters are cold, but generally, compensation for slow growth in the winter is given by the earlier autumn break.

Land Usage

In the valleys of this eastern section the soils and climatic conditions are suitable for dairying; several butter factories draw their supplies from the area.

Practically the whole of the Victorian production of tobacco and hops is grown in the Ovens Valley, but the present acreage—tobacco 800 acres, and hops 150 acres—is very small. A small area of flax, a little wheat and oats, and some broom corn are also grown, but the erosion hazard due to cultivation is limited to a very small area. Although dairying is the main activity on the river flats, the region is most important as a cattle and sheep-raising area.

Most of the higher portions of the region are Crown lands, carrying timber of various species and utilized to some extent for the grazing of cattle under annual lease from the Crown.

Fire and the rabbit have been responsible for marked depreciation in the grazing value of this upper country and it is not able to carry nearly as many cattle to-day as in years gone by. Some of the cattlemen who in the past grazed their cattle in the bush are now learning that, by improving the pastures on the lower country and grazing their stock wholly thereon, they can get better results than by using the Crown lands.

The numerous river and creek valleys are rich, and, with the nearby hill country in combination, make up the pattern of a large number of properties in the area.

Pasture is the most important crop, and, on many of the flats, highly productive improved pastures have been established. The rising ground mainly supports natural pastures. These are capable of much improvement, and, provided rational grazing methods are adopted, this can be obtained without increasing the erosion hazard.

Erosion Hazard

Throughout the eastern section, much of this rising ground is of granitic or metamorphic origin and is liable to severe sheet or gully erosion if denuded of vegetative cover.

Erosion has occurred in many places as the direct result of overstocking with cattle or sheep, but more particularly



Sheet erosion on a bare hill-top near Wodonga, resulting from its use as a sheep camp.

where rabbits are prevalent. With improved pastures the safe carrying capacity could be increased, and, if overgrazing were avoided, the land could be managed with minimum loss of soil through erosion.

Where rabbits are prevalent, their eradication is probably the most important initial step to take for the protection of the soil. With few exceptions rabbit control has been only partially successful. The rough country adjoining many of the properties is hard to work in, and provides protection and breeding grounds for the rabbits. The present difficulty in obtaining wire netting, particularly foot netting to keep boundary fences rabbit proof, is contributing to the rabbit infestation of much of the area.

On the High Plains, which provide the upper catchments for the rivers of the region, grazing is possible only during the summer months. On the Bogong High Plains control of erosion is undertaken by regulating the number of cattle grazing on the plains according to the condition of the pastures. Each season the High Plains are inspected by an Advisory Committee operating on a voluntary basis comprised of representatives of cattlemen and Government Departments. This committee decides the number of cattle which can safely be grazed and the period for which grazing will be permitted. A second committee of cattlemen with a Lands Department officer as Chairman, allots the numbers to the licensees.

The forest resources of the Upper Murray Region are extensive. Approximately 2,000,000 acres of the region is forest land, but of this less than one quarter (423,700 acres) is permanently dedicated as State Forest and Timber Reserves.

The region is particularly suited to the growth of coniferous species, and pine plantations totalling over 2,000 acres have been established in the Bright, Ovens, Stanley, and Beechworth districts.

The natural forests are indigenous hardwoods of several species.

The protection of the catchment areas and the prevention of erosion damage along the streams is closely linked with the preservation of the forest areas. The fire hazard is high and the inaccessibility of the forests has made fire control a very difficult problem. The Forests Commission has undertaken extensive control measures, but, without the co-operation of everyone concerned, these can only be partially successful. Fortunately, landholders have become more fire conscious in recent years, and the haphazard lighting of fires to stimulate pasture growth is diminishing.

The disastrous fires of 1939, which swept a large portion of the Region, resulted in the destruction of large quantities of timber and caused losses which cannot be replaced for many decades, and then only if conditions for regeneration are favorable.

The fire risk will always remain high and the preservation of the forests can

only be ensured by maintaining a highly-efficient control organization. The co-operation of the landholder is essential if fire-control measures are to be efficiently carried out.

OCCURRENCE OF EROSION

The climatic, soil, and topographical features of the region are such that a very severe erosion hazard could be quickly built up by neglecting precautionary measures. The possible far-reaching effects of such neglect are apparent when the vital importance of the Region to the national economy is considered.

Much has been done by individual landholders to check and prevent erosion in specific places, but much more is necessary to ensure that our next greatest national asset to the soil itself, an assured water supply, is not imperilled by neglect or lack of understanding of methods of conservation.

The Soil Conservation Board has established experimental and demonstrational areas in the Omeo district and has demonstrated that erosion can be controlled by modifying agricultural or grazing practices, aided in some cases by the adoption of simple mechanical measures.

The problem of erosion control varies considerably on different properties and use should be made of the advisory services offered by experienced officers of the Board whenever active erosion becomes apparent.

Results will be more easily achieved if remedial measures are taken before the damage is severe.

Erosion in the catchment takes various forms.

Stream Erosion

Stream erosion is common, particularly along the middle sections of the main rivers, such as the Mitta river between Mitta and Tallandoon, and the Ovens from Harrierville down to Everton.

It is also severe on many of the creeks such as the Nariel and Tallangatta creeks. It results in the loss of the best of all soils—the alluvium of the river flats. This material is quickly transported downstream and deposited by siltation either on lower flats or in reservoirs.

As a protective measure the planting of willow trees at vulnerable places along the stream can be very effective. The trees should be planted in such a manner that the course of the stream is stabilized rather than diverted. Where diversion is desired, supplementary mechanical aids in the form of groynes or diversion structures may be built.

The removal of trees and other obstructions within the stream is often desirable to prevent sudden changes of course and to stabilize the stream. Such works should not be undertaken without first obtaining the advice of the Soil Conservation Board or the State Rivers and Water Supply Commission.

The type of construction and best method of application will vary considerably, and structures erected without a complete understanding of the problem may not produce the desired effects.

For stream bank protection, grants may be made by the State Rivers and Water Supply Commission to shire councils and other bodies on behalf of landowners to meet part of the cost of the protective works.

Gully Erosion

Gully erosion is not so general throughout the region as in some other



Banks of the Nariel Creek protected from erosion by an effective growth of willows on Mr. J. Carmody's property.

parts of the State. It is, however, quite common, and there are areas where very severe gullying has occurred.

Sheet Erosion

Sheet erosion can be seen in varying degrees throughout the whole Region. Much of it is masked during the present year because of the good seasonal conditions, but whenever the vegetation on a piece of sloping land becomes depleted, loss of soil commences. As most of our surface soils are merely a few inches in depth, the loss of every $\frac{1}{4}$ inch from the surface is a matter of grave concern.

A large part of the soil washed away by sheet and gully erosion is deposited on lower land, frequently over soils of higher fertility, thus reducing the production from these lower lands.

Fortunately, the form of erosion known as tunnelling is not frequent in the Upper Murray Region.

EROSION CONTROL

The control of sheet erosion and the early stages of gully erosion on cultivation and grazing land usually depends on a reduction of the rate of run-off of water. On grazing lands this is largely a matter of restoration of vegetative cover and can be achieved by pasture improvement, closer attention to grazing practices, and the elimination of the rabbit.

The action of improved pastures in protection against soil erosion is twofold. The production of a greater bulk of feed and consequent increased ground cover gives the soil a direct protection against water action. With well-managed pastures the fertility and structure of the soil are usually improved, and by its capacity for increased absorption, the soil is able to take up water which would otherwise constitute a run-off hazard.

To be effective, pasture improvement must be accompanied by rational grazing practices. Too often the benefits of pasture improvement are offset by increasing the stocking rate to such an extent that the soil becomes more vulnerable than before. In cultivation paddocks, cultivation on the contour and the widening of the cropping rotation to include longer periods under pasture will reduce the occurrence of erosion damage.

In the more advanced stages of erosion, and in places where the hazard is naturally high, it becomes necessary to adopt supplementary control measures. In some cases, contour furrows are required to absorb the water or check the rate of surface flow sufficiently to prevent soil movement. In others, diversion banks on a slight grade may be necessary, and, in cultivation paddocks, terracing and cropping on the "contour" may be desirable where the slope is sufficient to encourage the soil to erode.

The provision of a protected permanently grassed waterway to take surplus water from a cultivation paddock will pay dividends in the maintenance of the farm.

The objective of all these measures is the spread and absorption of water and reduction of the rate of run-off, and it is necessary that the operations extend above the eroding area. Grassing with persistent pasture types and judicious planting of trees will assist in the healing of gullies, but these can be only partially effective unless the catchment above the gully is protected, or the water is diverted and spread or otherwise safely disposed of.

With sheet erosion, contour furrows and improved vegetative cover are generally all that is necessary, even in severe cases. In some cases it is desirable to close up the area until the cover is established. In some severe cases the whole method of farming may have to be reviewed.

The advisory officers of the Soil Conservation Board and the Department of Agriculture are available to assist any landholder who may be in doubt regarding methods of control of erosion or of land use.

COMMENTS ON ENTRIES

Twelve entries were received for properties within the region. Although this number is small, it was considered quite satisfactory for the first year. The properties which were scattered throughout the area, covered a wide range of types of country and land utilization, and the landowners were able to show many interesting and creditable measures of soil conservation.

The winning property, owned by Mr. L. Cox, is an orange grove situated on the foothills of the Warby Ranges, Wangaratta South. The type of soil and slope of the

land are such that the risk of erosion is high. Considerable erosion had taken place on one half of the orchard which had been planted on the normal square system. The second half was planted on a contour layout, each row being placed on a terrace bank. Soil loss from this section has been negligible and maximum retention of moisture is obtained.

Contour banks have been placed through the older section and soil loss is now reduced to a minimum. The steep slopes above the orchard have been left in timber and diversion channels immediately above the orchard lead the surplus water away to safe outfalls.

A very efficient water supply is provided from a concrete-lined pool into which water is pumped from a spring.

Track maintenance is good, frequent small diversions from the roadways leading water on to adjoining grassland. Trees have been used to protect and hide an old gravel pit, and the home and buildings are given a picturesque setting with trees and shrubs.

Mr. L. V. Brown's property, "Kilchamaig," Tallangatta, is situated in the Tallangatta creek valley. This is a



A brick drop placed along the line of a graded bank in Mr. L. Cox's orange grove at Wangaratta South.

dairy farm of 280 acres. Most of the property is flat to slightly undulating, but there is one hill feature of about 20 acres where the erosion hazard is high. However, the native trees and grasses have been maintained on the steep slopes, providing effective protection.

Stream erosion has been severe on the Tallangatta creek and its tributary the Cascade creek. This has been effectively checked by the planting of willows and the construction of short groynes.

Subdivision of the property is well planned. Pasture improvement is general and a good supply of hay and silage provides a safeguard against periods of shortage.

The Tallangatta creek also passes through Mr. H. Ortlipp's property at Cascade near Tallangatta. This dairy farm is 130 acres in area and consists largely of creek flats and higher terraces. Creek erosion has been severe. Extensive planting of willows has not only provided protection from erosion, but has caused the deposition of silt over an area previously eroded. The willows are used as a fodder reserve.

The property of Mr. W. H. Fleming, also at



A diversion channel on Mr. Cox's property, designed to carry away surface water from the orange grove.

Cascade, Tallangatta, is largely hill country with a total area of 665 acres. It is used for dairying and the grazing of sheep. The hills are of granitic origin, the soil being liable to erosion. Some old shallow gullies are apparent, but Mr. Fleming has been able to arrest the erosion that had started and to stop any further development on his cleared paddocks by careful grazing management and the retention of a good grass cover. Rabbits have been eliminated from the cleared part of the property. Good use is made of timber for shade and shelter and a large area of uncleared bush on steep hills has been retained. Springs have been tapped and led into troughs for water supply. Creek erosion has been severe, but is now stabilized with *paspalum* and other grasses, reeds, and willows.

Mr. T. W. Mitchell's property, Towong Hill, is an extensive property on the River Murray near Corryong. There is no erosion problem on the large area of river flats, but river bank erosion has been extensive. This has been arrested by the careful planting of willows and by log revetments.

The hill country is very susceptible to gully and sheet erosion and in the past, several severe gullies have developed. One of these gullies has been fenced out, and closely planted with trees including poplars and willows in the bed, with pines around the head and sides. This treatment has arrested the progress of the gully and a fine stand of commercially-valuable timber is growing.

The tops of some hills have been left in timber and fifteen pine plantations have been grown. A small area of contour furrowing and a dam to take the peak of the flood flow have helped to stop the headward movement of the worst and most spectacular gully. Other gully protection works are planned.

Mr. James Carmody, of Nariel, was placed second in the competition. This property is a small cattle-grazing farm of 360 acres freehold and 319 acres of recently rented land, and comprises fertile alluvial flats adjoining the Nariel creek and running back to steep, timbered hills. Mr. Carmody has occupied the property since 1930, although it has been in the family for over 60 years. Results have been achieved not so much by mechanical means such as contour furrows or gully control structures, as by grazing management and the intelligent use of vegetation.

Highly developed and well balanced pastures on the flats provide most of the grazing. The hills remain tree-covered right to the edge of the flats, but native grasses in the bush give a good balance.

The Nariel creek, which is liable to severe erosion, is bounded by a steep hill on one side and a willow plantation on the other. The free, unobstructed flow of the creek through stabilized banks on Mr. Carmody's property is a striking example of how valuable soil can be saved by intelligent application of methods readily available to most landholders. No special structures have been necessary to hold the stream to its course.



A section of Mr. J. Carmody's farm at Nariel. Timber has been retained on the hills rising from the creek flats.

Rabbits are kept in check by regular cyaniding back into the bush throughout the winter, and, although the boundary fence, which was destroyed in the 1939 bush fires, has not been completely restored, this competitor's method of controlling rabbits appeared to be very effective.

Some small diversion banks were recommended as likely to be more effective in checking the small gullies than the logs which Mr. Carmody had been using. A fence separating the grazing country from the timbered hills is under construction, and, when complete, will give a further measure of control by the elimination of cattle tracks.

Shelter provided for stock was adequate and young plantations of ash, poplar, oak, and other trees will add later to the already attractive appearance of the property.

The arrangement of the paddocks has enabled the grasslands to be grazed effectively and this has been reflected in the condition of the stock and pastures. The stock are watered from permanent creeks and springs and the household is supplied by water led through a diversion race from Carmody's creek to a pipehead leading to the house and garden.

Mr. Carmody's property is an outstanding example of how high production can be obtained without soil losses under conditions of relatively high erosion hazard, and it was only by a very narrow margin that it failed to win the competition.

Mr. W. B. Lawrence, Walwa, entered his grazing property, most of which is hilly, and on which there is a high degree of erosion hazard. This competitor has tried contour furrowing and some diversion furrows. These latter proved to be on too steep a grade and kikuyu grass is being used effectively to prevent the consequent erosion.

Mr. K. D. Watson, "De Kerilleau," Wodonga, has an extensive property fronting the Kiewa and Murray rivers and the Wodonga creek. The hill country is subject to sheet erosion and gullying and an endeavour has been made to arrest this development by diversion and tree planting. Advice was given regarding diversion and spreading of water.

Mr. C. Robinson practises dairying and fat-lamb raising on his property near Beechworth. He has used log and stone structures for gully-head control, also willows, kikuyu grass, and *paspalum distichum*. Tree planting has resulted in control of creek erosion. Effective use is made of a natural water supply.

On the property of Messrs. N. F. and R. W. Gibb, Moyhu, run-off water, formerly causing gully erosion, has been diverted and spread effectively on grassland. The 5-ft. deep gully was filled in with a disc plough and grassed over. Messrs. Gibb propose an extensive programme of soil conservation.

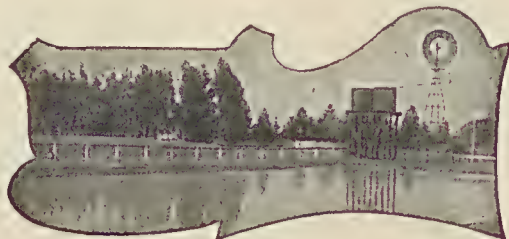
Mr. J. H. Dinning, Greta, practises mixed farming on an undulating property adjoining the Fifteen Mile creek. He uses a rotation of wheat, oats, and three years in pasture. It was suggested to Mr. Dinning that he introduce a full clover-leys system. This competitor has diverted water from a gully head for control purposes.

Increasing interest in future competitions and soil conservation in general is anticipated.

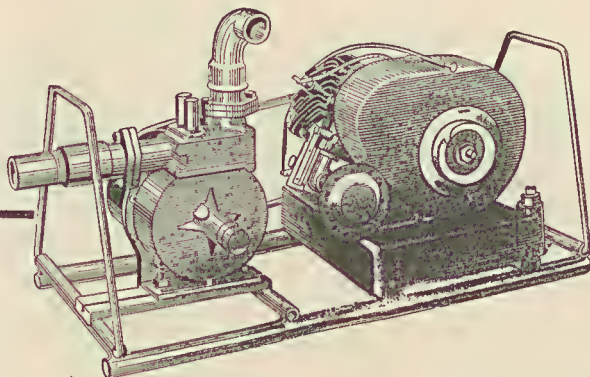
Trophies were presented at a well-attended field day held on Mr. Cox's property at Wangaratta South.

ACKNOWLEDGMENT

The Soil Conservation Board acknowledges the assistance given by the Upper Murray Regional Committee and the Shire Councils in the area in organizing the competition.



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ASSOCIATION HERD TEST

Report for Year 1947-48

By C. J. Bradbury, B.Agr.Sc.



Averaging 485 lb. butterfat, Mr. R. J. Connor's herd of 10 cows in the Milawa No. 1 Association occupies the leading position in this year's Association Herd Test.

YIELDS recorded in the Association Herd Test during the year have been quite good, and, on the whole, show substantial progress. True, the early part of the year was favorable for heavy pasture growth in most grazing centres, although top-dressing activities were still far from the pre-war level.

The latter part of the year, especially in Gippsland, was unusually dry, and this affected adversely the yields of cows which completed their tests in this lean period.

In several units, some of the high yields were not recorded owing to inability to secure herd testers, while, in other areas, herd-tester changes seriously interfered with the efficient control of the testing work.

Notwithstanding these adverse influences, the 252-lb. butterfat average of 86,276 cows, though 12 lb. lower than the record average of last season, must be gratifying to all dairy farmers.

LEADING ASSOCIATIONS

The 313-lb. butterfat average for 862 cows gains pride of place for Cohuna No. 2 Association, while Tallangatta, with an average of 310 lb. fat for 902 cows, leads the North-eastern area and gains second placing in the State.

Swanpool No. 1, another North-Eastern unit, also exceeded the 300 lb. average.

Stanhope, Tongala No. 1, and Swan Hill were three other Goulburn Valley units to average over 290 lb. butterfat, while Upper Murray No. 2 with 1,057 cows averaged 296 lb. Dumbalk North leads the Gippsland area with a 297 lb. butterfat average for 965 cows.

Nineteen units had averages exceeding 275 lb. butterfat, and these included Merri-gum No. 1, Cohuna No. 1, Katandra West, and Tongala No. 2 in the Goulburn Valley area, while Gippsland is represented by Warragul No. 1, Dumbalk, Maffra-Sale No. 3, Traralgon No. 3, and Korumburra No. 4.

With an average of 275 lb. butterfat, Warrnambool No. 1 leads the Western District from Ecklin South and Port Campbell units, each of which contained over 1,000 cows.

OUTSTANDING HERDS

This year's results include no fewer than 428 herds averaging 300 lb. butterfat or better, and these included 98 herds that exceeded a 350 lb. average.



Portion of Mr. A. E. Barton's herd of 73 cows (Kiewa Valley Association).
This herd averaged 379 lb. butterfat.

Twenty herds had averages of 400 lb. or better, and included the two leading herds of Mr. R. J. Connor and Mr. W. Matthews each with averages exceeding 450 lb. butterfat.

Mr. R. J. Connor's herd of ten cows in Milawa No. 1 Association is the leading herd in this year's report with an average of 485 lb. butterfat, while the fifteen cows of Mr. W. Matthews of Leongatha No. 1, with an average of 452 lb. butterfat, gained second placing.

Mr. M. T. Williams, Swanpool No. 1, with an average of 439 lb. for eleven cows, and Mr. W. J. Wilson, of Cohuna No. 2, and Mr. H. Kay, of Swan Hill, each with sixteen cows, were also prominent in the small-herd section.

In the 20 to 39-cow class no fewer than twelve herds had averages exceeding 400 lb., and these were led by Mr. H. McLean's herd of twenty cows with an average of 446 lb. butterfat.

Narracan No. 1 is well represented by Mr. A. W. Hasthorpe's 31 cows with an average of 440 lb. fat, while, with averages of 433 lb. and 427 lb., the herds of Mr. T. A. Dickie of Katandra West and Mr. K. McLean of Leongatha, are deserving of praise in this section.

Other herds in this section that exceeded the 400-lb. average are owned by Mr. T. McNicol, Tongala No. 2; Messrs. J. A. Warnock and W. Renkin, of Swanpool, No. 1; Mr. T. Gaw, of Bass; Mr. A. E. Jeffries, of Kongwak; Mr. R. A. Seabrook, of Korumburra No. 1; Mr. H. W. Burgman, of Katandra West; and Mr. J. Martin, of Stanhope.

The 40 to 59-cow section is headed by Mr. W. J. Brennan, of the Swanpool No. 1 Association, with an average of 428 lb. for 40 cows. This yield is closely followed by the 425-lb. herd average of Messrs. W. Hornsby and Sons' 46 cows, in the leading Association (Cohuna No. 2).

Messrs. Harrison Brothers, Korumburra No. 4, with 40 cows, and Mrs. M. H. Park, of Tallangatta, with 58 cows, own two outstanding herds in this section each with averages of over 400 lb. butterfat.

Other leading herds in the 40 to 59-cow section belong to Mr. E. A. Swayn, of Stanhope; Mr. Alex Walker, of Yinnar; Mr. F. Phillips, of Cohuna No. 2; Mr. S. R. Fuller, of Tongala No. 2; Mr. H. Holmes, of Traralgon No. 3; and Mr. J. G. Findlay, of Upper Murray No. 2 Association. Each of these herds had averages exceeding 390 lb. butterfat.

HERDS OF LESS THAN 20 COWS.

Owner.	Association.	Cows.	Butterfat.
			lb.
R. J. Connor ..	Milawa No. 1	10	485
W. Matthews ..	Leongatha and District No. 1	15	452
M. T. Williams ..	Swanpool No. 1	11	439
W. J. Wilson ..	Cohuna No. 2	16	424
H. Kay ..	Swan Hill ..	16	399
N. Davidson ..	Buchan-Nowa Nowa No. 1	17	393
C. I. Pool ..	Bairnsdale No. 2	12	391
P. W. Henson ..	Swan Hill ..	10	384
H. A. Hotchkin ..	Narracan Shire No. 2	11	367
C. Meharry ..	Kerang No. 2	18	363
A. I. Stewart ..	Milawa No. 1	14	361
W. J. Morgan ..	Moyhu No. 1..	19	357
F. G. Williams ..	Tongala No. 1	16	352
Miss Elliot ..	Pakenham No. 1	13	350
G. J. McLeish ..	Warragul No. 1	18	347
J. Skinner ..	Echuca ..	17	342
A. G. Maben ..	Bairnsdale No. 2	18	341
M. K. Orgill ..	Swan Hill ..	18	341
O. W. Burgman ..	Traralgon No. 3	17	341

HERDS 60 TO 79 COWS

Herd-testing farmers who realise the difficulty of securing high herd averages from large herds will appreciate the excellent herd management that must have been effected by the 23 owners whose herds averaged over 300 lb. butterfat in this section.

Mr. J. G. Howell, of Leongatha No. 2, with 62 cows, and Mr. R. Farragher, of Woodford No. 1, with 69 cows, deserve a special mention for their excellent herd averages of 396 lb. and 392 lb. respectively, while Mr. L. Affleck, of Traralgon No. 1, and Mr. A. E. Barton, of Kiewa Valley, each with 73 cows, returned the good figures of 388 lb. and 379 lb. The 69 cows owned by Mr. W. H. Findlay, of the Upper Murray No. 2 Association, returned the good average of 375 lb.

In this section, Mr. G. R. Jones, of Warragul No. 1; Mr. G. Dodd, of Dumbalk No. 1; and Mr. F. B. Tonkin, of Undera No. 1, were others whose herd averages exceeded 340 lb., while the herd of Messrs. R. J. Wells, G. W. Purdey, C. Hill, and Northey and Co. Ltd., had averages of 330 lb. or better.

HERDS OF 80 COWS OR MORE

This section, with twenty herds averaging over 250 lb., and including seven with averages exceeding 300 lb., was led by the 80 cows belonging to Mrs. A. Crosthwaite, of Kiewa Valley No. 2, with the excellent average of 375 lb. butterfat.

The herds of Messrs. H. H. and L. Trease and of W. York, both of Dumbalk North, averaged 339 and 338 lb. respectively, while Mr. C. D. Crosthwaite, with 97 cows, Mr. E. M. Bourne (87 cows), Mr. A. J. Menzies, and Messrs. H. Batten and Son, with herds of 81 and 85 cows respectively, had herd averages exceeding 300 lb.

COWS EXCEEDING 300 LB. BUTTERFAT

Of the 22,961 cows that exceeded the 300-lb. butterfat level, no fewer than 3,852 cows yielded over 400 lb.

Included in these were 401 cows with yields of 500 lb., and 41 exceeding 600 lb. These include four mature cows with records of more than 700 lb. butterfat.

Jessie, the leading cow, is owned by Mr. J. G. Howell, of Leongatha No. 2, and her yield of 11,925 lb. milk and 754 lb. butterfat was closely followed by Messrs. G. and F. Brady's, Bluey, of Traralgon No. 3, with a yield of 747 lb. butterfat from 12,341 lb. milk.

Mabel and Beryl, owned by Mr. A. M. Freestone and Mr. T. K. Kelly respectively, also exceeded 700 lb. butterfat.

Of the other 31 mature cows that yielded over 600 lb. butterfat, Jean, owned by Mr. E. Brady, Traralgon No. 3; Avon Sunflower, in the herd of Mr. O. S. Martin, Traralgon No. 2; and Verna, owned by Mr. A. W. Hasthorpe, Narracan, each yielded 669 lb. butterfat. Verna headed the four-year-old section last year with a record of 690 lb. butterfat.

THE FOUR-YEAR-OLDS

The leading twenty four-year-olds all exceeded 540 lb. butterfat, and included five cows with yields over 600 lb.

Leading this section is Glenloth Mavis, owned by Mr. M. Drane, of Traralgon No. 2. This cow yielded 15,695 lb. milk and 668 lb. butterfat. She is closely followed by the 660 lb. butterfat yield of May, from Mr. C. V. Ludeman's herd (Nirrandra No. 1).



Top producer of the year, Mr. J. G. Howell's mature cow, Jessie, with a yield of 754 lb. butterfat.

Jessie, Elinure Priscilla, and Canary, each with 629 lb. butterfat, attained equal third position for their respective owners, Mr. A. E. Jeffries, Kongwak No. 1; Messrs. J. A. McKinnon and Son, Port Campbell; and Mr. A. E. Saunders, Maffra-Sale No. 1.

THE THREE-YEAR-OLDS

The three-year-olds included fifteen cows with yields exceeding 500 lb. butterfat. Topsy, with a milk production of 11,839 lb., and 623 lb. butterfat, led this section for her owner, Mr. T. A. Dickie, Katandra West No. 1.

From Eskdale No. 1, Mrs. E. Cardwell's Poddie, with 578 lb. butterfat, is placed second in this age section, while Betty and Fanny, owned by Mr. L. J. Affleck and Mr. A. W. Hasthorpe, were the other three-year-olds to exceed 550 lb.

Other three-year-olds yielding over 530 lb. were B. Waverley Lass 6th, Dainty, Denbigh Peach, and Gloria, owned by Mr. W.



One of the year's leading three-year-olds, Betty, owned by Mr. L. J. Affleck, (Traralgon No. 1 Association). Betty produced 558 lb butterfat.

Matthews, Mr. L. Gilbert, Mr. N. Kulne, and Mr. L. J. Hanley respectively.

THE TWO-YEAR-OLDS

The top nineteen two-year-olds this year exceeded 440 lb. butterfat, and included seventeen cows with yields of 450 lb. or better.

With 500 lb. butterfat from 7,752 lb. of milk, Bangor Stumpy 2nd, owned by Mr. W. Matthews, of Leongatha No. 1, took pride of place in this section.

Messrs. D. and E. R. Mildren's Agnes, from Upper Murray No. 2 Association, was placed second with 493 lb. butterfat, while other good yields were recorded by the representatives in this class in the herds of Mr. C. Tucknott, of Stanhope; Mr. J. A. Warnock, of Swanpool No. 1; and Messrs. D. and R. Pardew, of Orbest No. 1.

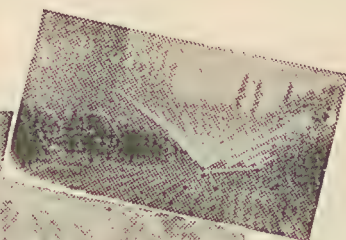
Further details of this year's recording work will be found in the tables accompanying this report.

(continued on page 518.)

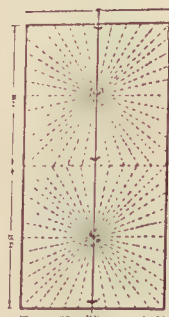


These two leading cows in the Milawa No. 1 Association are owned by Mr. R. J. Connor. Margaret (left) produced 592 lb. butterfat and Maureen (right) 553 lb.

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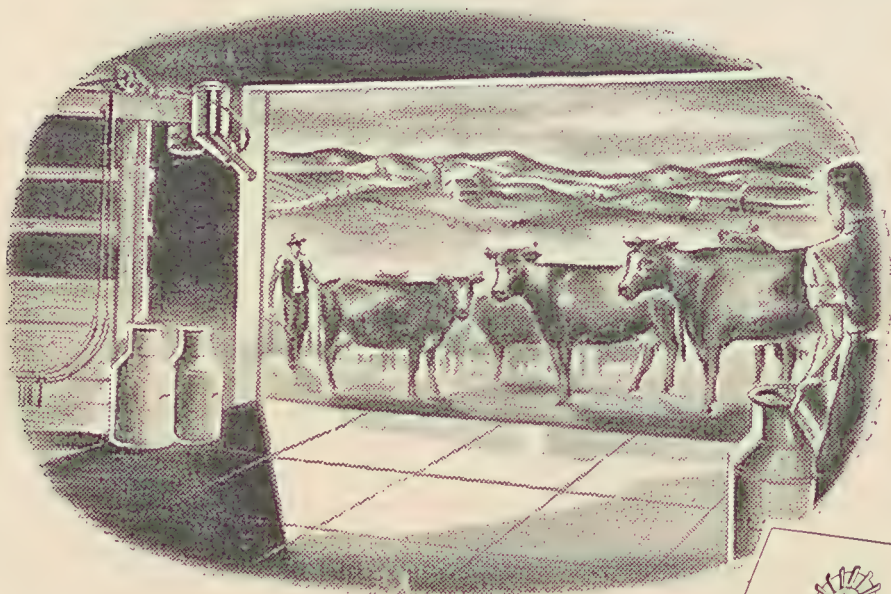
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CONSTRUCTION OF CATTLE YARDS AND CRUSHES

By A. C. T. Hewitt, M.Agr.Sc., Live Stock Science Officer

WELL-DESIGNED and constructed yards and crushes are necessary on beef-raising properties if the cattle are to be handled easily, and with a minimum of labour and injury to animals. In the construction of stock-yards, economy of design must be considered; therefore, essential features only have been included in the accompanying plans.

LAY-OUT

Fig. 1 includes four holding yards each 50 feet by 50 feet, capable of comfortably holding 75 head, a ring-yard 25 feet in diameter, and a race which includes facilities for drafting, de-horning, hoof-trimming, and loading, and can be used for handling sick animals. Allowing 30 to 35 square feet per animal, mobs of up to 100 head can be handled in these yards.

For properties on which greater or smaller numbers are to be handled at the one time, modifications may be made by having more or fewer holding yards and by making the sizes of individual yards larger or smaller according to individual requirements. The lay-outs may vary from farm to farm, especially as existing yards could be incorporated in some instances.

The 7ft. 6in. entrance gates to the yards are shown on the plan at the corners against the boundary fences. They may be located, however, to suit the convenience of the farmer, depending on the lay-out of the adjoining paddocks and lanes.

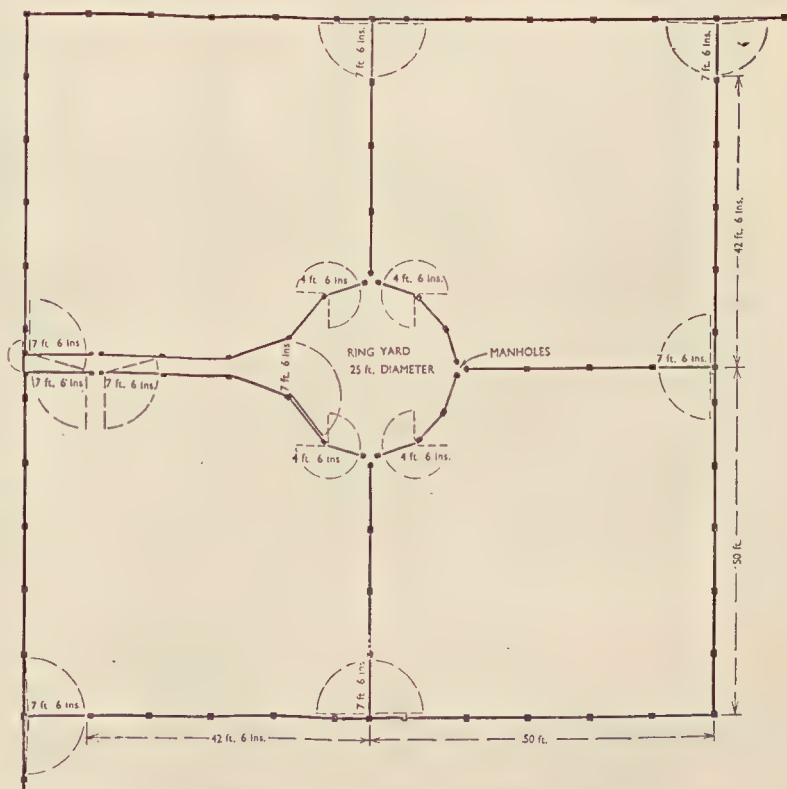


Fig. 1—Lay-out of cattle yards showing holding yards, ring-yard and race.

HOLDING YARDS

Each holding yard connects with the adjacent holding yards by 7 ft. 6 in. gates, and with the central ring-yard by 4 ft. 6 in. gates. The fences are 5 ft. 6 in. high, including the 4 in. by 3 in. hardwood or 6 in. diameter sapling cap. Either split or sawn timber may be used for the posts and rails, but the split posts and rails are generally preferred, except, perhaps, in the race where sawn rails are more easily bolted on. It is essential that all sawn timber be straight-grained to minimize the risk of its breaking under pressure.

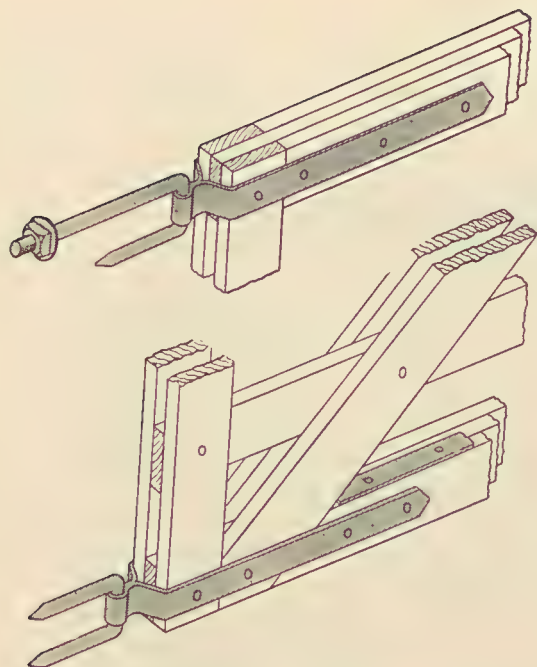


Fig 2.—Details of hinges designed to permit gate to swing on either side of fence.

The yard fences are best constructed by mortising the posts to take the rails, but the bolting of the rails to the posts—on the inside wherever possible—is quite satisfactory. Split posts should be approximately

10 in. by 5 in., split rails 8 in. by 2 in., and sawn rails at least 6 in. by 1½ in. Each fence panel is the standard 9 feet between centres.

Gateways of 8 feet between the faces of the posts are needed for the 7 ft. 6 in. gates, and gateways of 4 ft. 11 in. for the 4 ft. 6 in. gates.

The gate posts should be heavier than the fence posts and carried up to about 7 feet above ground and capped.

THE RING-YARD

The central ring-yard is used both as a drafting yard and for feeding the race to the crush and loading ramp. It is a feature which has proved successful for drafting moderate numbers of cattle. A few cattle are run into the ring-yard at one time, and, by driving them around it, they are drafted into one or other of the holding yards. A 7 ft. 6 in. gate admits the stock to the race.

If desired, the ring-yard may also serve two races, one leading to the crush and the other to a loading ramp, as well as the four adjoining yards.

MANHOLES

Ten-inch manholes are provided beside each gateway in the ring-yard and behind the crush. These are labour-saving and safety measures, permitting quick and easy

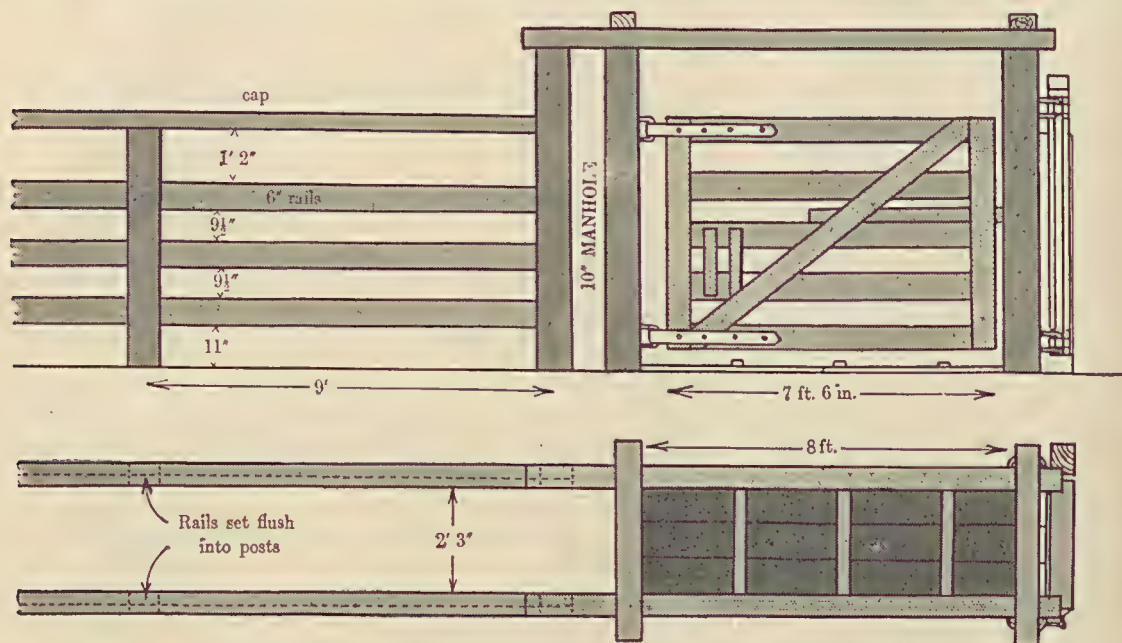


Fig. 3.—Plan and side elevation of a simple race and crush.

passage for the operator from one yard to another, while effectively stopping the cattle. For handling calves, the width of the lower 2 ft. 6 in. portion of the manhole should be narrowed down to 6 inches, which is quite enough for a man's legs to pass through. This is done by fastening a 2 ft. 6 in. length of 3 in. by 2 in. timber on the inside of each post of the manhole.

GATES

The gates are 5 feet high and 7 ft. 6 in. or 4 ft. 6 in. long, and are constructed of 6 in. by 1½ in. timber. They are hung 6 inches above-ground to be level with the top of the fence. The braces or stays, placed on both sides of the gate, should extend from the lower corner on the hinged end of the gate to the top corner at the free end. Each gate is fastened by a piece of 4 in. by 1½ in. timber sliding between the braces and end uprights of the gate along the third rail and into a slot in the gate post.

Short pieces of 6 in. by 1½ in. timber are needed on both sides of the top and bottom rails under the hinges. The gates are stronger, but much heavier if this timber is extended right along the rails, giving three thicknesses.

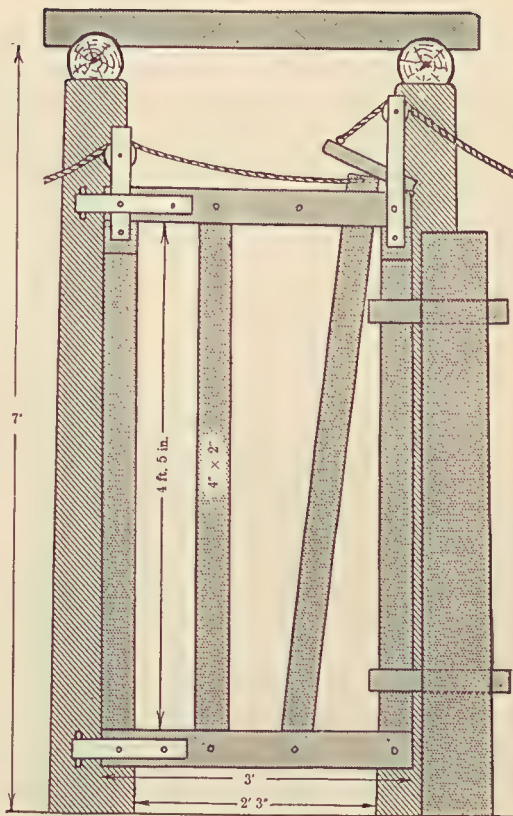


Fig. 4.—Details of neck bail for simple crush illustrated in Fig. 3.

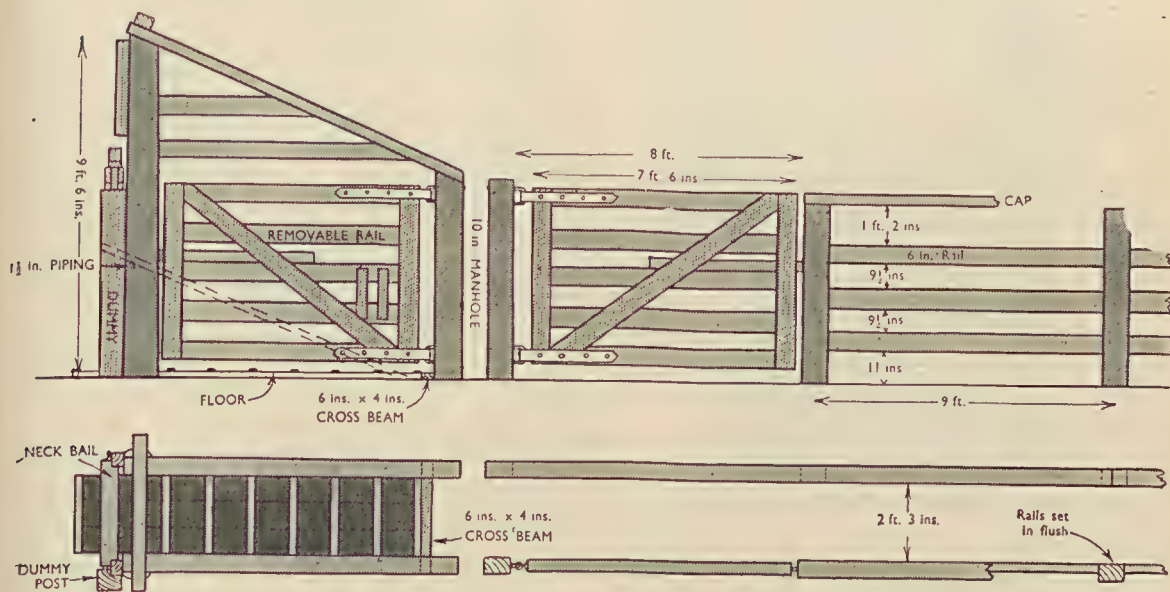


Fig. 5.—Plan and side elevation of race and crush incorporating loading ramp.

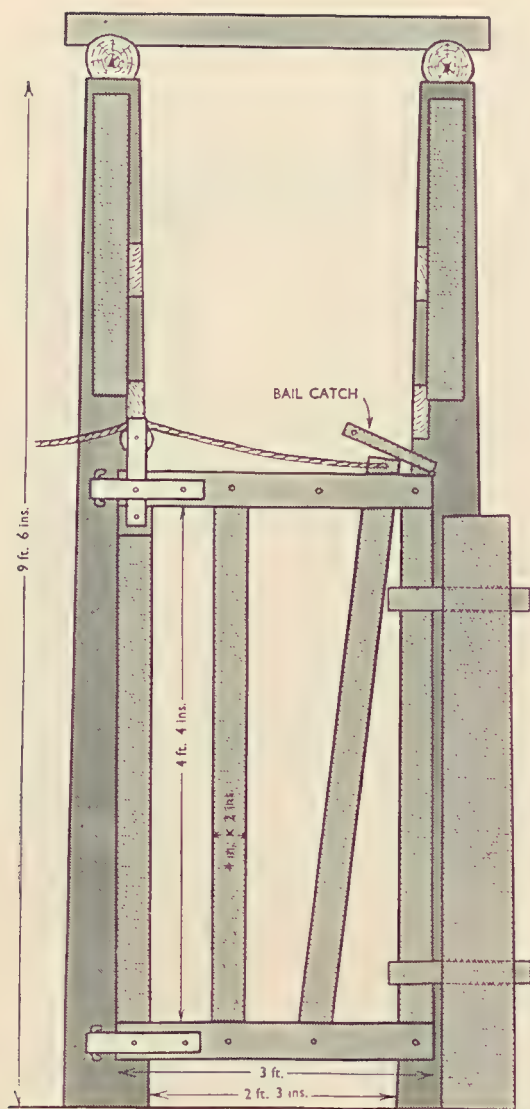


Fig. 6.—Details of neck bail for crush and loading ramp shown in Fig. 5.

The hinges shown (Fig. 2) were designed to permit the gate to swing to either side of the fence. For the top hinge, the upper leg of the staple must be long enough to be bolted through the post.

As the bottom rails of the gates in the crush may be worn by the animals' feet, they may be protected by strips of 2 in. by $\frac{1}{8}$ in. iron, fastened to the inside upper edges, and, to facilitate handling the animals in the crush, the second-top rail of the crush gates can be made removable.

Plans of a simple race and crush with a neck-bail built into a gate at the end are shown in Fig. 3. With this type of race, most drafting would be done in the ring-yard, as stock going through the race could only be run into the holding yard on the left or straight out the end of the crush. An extra gate built into the other side of the crush, and hung the other way round, would facilitate drafting and enable cattle bailed up in it to be approached from either side. The wooden floor for hoof trimming is fixed.

In Fig. 5 the plans include extra gates and a floor to the crush which can be raised to form a loading ramp. Otherwise the main features of both races and crushes are the same. The inside width of the race and crush is 2 ft. 3 in., and this is found to be wide enough for all stock.

For use as a crush, the end of the race is closed by the gate into which a neck-bail is built. This gate is hung in the same way as the other gates, except that both the top and bottom hinges are bolted through the post. It is essential for this gate to swing right back out of the way when the race is to be used for loading stock. It is fastened across the race by two rails sliding into the dummy post. The bail gate is 3 feet wide and 5 feet high, giving a height of 5 ft. 6 in., as it is hung 6 inches above-ground.

When an animal is driven into the crush it is prevented from backing out by sliding a rail behind it through slots provided in the gates. The neck-bail is closed on the animal's head by pulling the rope which passes over the pulley to it. This allows the catch to fall, holding the bail closed. A bolt can be put through or behind the bail to relieve the pressure on the hinge of the catch or to give a smaller neck space. The animal is released by lifting the catch and pulling out the bolt.

LOADING RAMPS

While the floor of the crush in Fig. 3 is more or less a fixture, the one in Fig. 5 is movable. By opening the bail gate and raising the floor, the crush is adapted to become a loading ramp. The floor, made of three 9 in. by 2½ in. red gum or jarrah planks 10 feet long, is raised and rested on a length of 1½ in. piping which is passed

under it through the two end posts at a height of 3 ft. 9 in. from the ground. As the floor should project as far out as the face of the dummy post, and be supported as near the end as possible by the piping, the holes to carry the piping will need to be only 2 inches back from the front of the posts. To provide a footing and strength to carry the stock, 2 in. by 1½ in.

cleats are bolted 1 foot apart on both sides of the planks.

The floor is prevented from slipping back at the lower end by butting against a 6 in. by 4 in. crossbeam. This crossbeam rests against the two gate posts.

The dummy post which carries the bail fasteners helps to protect the race and fittings when vehicles are being backed in.

The drawings used in this article were prepared by J. D. Stewart, B.Agr.Sc., Science Field Officer.

OBITUARY

Mr. L. C. BARTELS

Readers will learn with profound regret of the death of Mr. L. C. Bartels, Senior Agrostologist of the Department of Agriculture.

Although he had been in indifferent health for some months, and had been away from his office for the greater part of this year, it was hoped until recently that Mr. Bartels would be able to resume duty, but his condition recently became much more serious and his sudden death at Werribee on 28th September came as a shock to his many friends.

Born at Allendale, near Ballarat, in 1893, Leo Christian Bartels was educated at St. Patrick's College, Ballarat, and later at the Melbourne University, where he studied agriculture and took the degree of Bachelor of Agricultural Science. Joining the staff of the Department in 1915, he conducted experimental work at the State Experiment Farm, Wyuna, for several years, and there developed a keen interest in irrigated agriculture.

In 1919, Mr. Bartels was placed in charge of the irrigated lucerne and pasture trials at the State Research Farm, Werribee, and the results of his work there greatly influenced the development of irrigation practices in this State. As Senior Irrigation Officer he was largely responsible for the successful establishment and development of pastures in the irrigation districts of northern Victoria, and his work in that connexion will be long remembered. In 1934, Mr. Bartels was appointed Senior Agrostologist of the Department of Agriculture, which office he held until his death.

He was a past President of the Melbourne University Agricultural Society and the Victorian Branch of the Australian Institute of Agricultural Science, and was actively associated with many local organizations at Werribee. Widely known throughout the pasture districts of Victoria, Mr. Bartels was noted for his kindly nature and ready wit. In his passing, Victoria has lost a citizen who has served it well, and the Department an officer of great knowledge and experience.



MR. BARTELS

[Weekly Times photo]

We greatly regret his passing, but are thankful for the memory of one who performed his appointed task so faithfully, and who contributed so richly to the honour of his profession.

[R.L.T.]

LIVE STOCK NOTES

Compiled by A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

MEAT PRODUCTION IN AUSTRALIA

TOTAL production of meat, excluding offal, in Australia during the year ended June, 1948, is estimated by the acting Commonwealth Statistician at approximately 942,100 tons (bone-in weight). This is 56,900 tons above 1946-47 production, but 34,400 tons below average annual production during the last three pre-war years.

Under wartime impetus, meat production in Australia rose from the pre-war level of 976,500 tons to a peak of 1,056,800 tons in 1942-43. It maintained a high level during 1943-44, but the effects of drought caused a subsequent decline to 983,500 tons in 1944-45 and to 805,300 tons in 1945-46. Production has since risen to 885,200 tons in 1946-47 and 942,100 tons in 1947-48.

The production of beef and veal rose from 487,800 tons in 1946-47 to 561,100 tons last year. There was also an increase in lamb production from 120,000 tons to 128,200 tons, but other meats declined, the fall in mutton being 15,900 tons.

Estimated meat production in 1947-48 was higher than in the previous year in all States except Tasmania. The largest increase was in Queensland where beef production was more than 40,000 tons higher.

The following table gives details of meat production in 1947-48 in comparison with the average for the three years 1936-37 to 1938-39, and each year 1943-44 to 1946-47.

PRODUCTION OF MEAT (EXCLUDING OFFAL): AUSTRALIA.

Unit: Ton (Bone-in Weight.)

Particulars.	Average, 1936-37 to 1938-39.	1943-44.	1944-45.	1945-46.	1946-47.	1947-48.*
Beef and veal	569,089	500,676	461,119	406,644	487,761	561,105
Mutton	201,388	275,391	257,225	197,801	182,570	166,693
Lamb	117,589	153,353	138,168	92,861	120,016	128,241
Pork	39,684	45,482	42,570	35,120	30,026	26,360
Bacon and ham (cured weight) .. .	32,511	45,723	56,290	48,587	47,668	43,929
Total meat (in terms of fresh) ..	976,517	1,043,487	983,517	805,307	885,201	942,143
New South Wales	310,499	337,519	303,371	289,111	277,867	287,610
Victoria	284,254	272,082	272,096	185,693	229,349	230,475
Queensland	242,982	250,296	234,247	187,561	231,436	272,284
South Australia	64,187	84,908	85,674	59,074	65,826	69,109
Western Australia	52,993	62,489	55,491	57,408	58,577	60,966
Tasmania	19,244	24,827	21,437	19,050	17,962	16,886
Australia†	976,517	1,043,487	983,517	805,307	885,201	942,143

* Subject to revision. † Includes estimates for production in the Northern Territory and the Australian Capital Territory.

PIGS AT THE ROYAL SHOW

Despite the many setbacks experienced by pig raisers in the last few years, stud pig breeders, by the quality of their exhibits at this year's Melbourne Royal Show, gave evidence of their confidence in the industry. In many respects exhibits were as good and in some instances better, than at previous Royal Shows. A definite impression was created that a revival in the pig industry is imminent, and that there is sufficient high-class breeding stock available on which to build a large and successful industry.

In the aged Large White boar class, Mr. Cockbill's Histon Eastern Lad (Imp.) was awarded first prize and later the championship and the English Medal for the best Large White pig in the Show. Mr. J. Cornell's boar was second and reserve champion, and Mr. R. Young's South Australian boar was third.

In the young boar classes there were some very good entries and some strong classes, but, as with most animals, the young are good to look at, later passing through an ugly stage before reaching maturity. One outstanding boar owned by Messrs. Bidgood Bros., of Wodonga, was the first prize winner. This boar, which was in the nine to sixteen-months class, pleased both judge and spectators, and might have been considered for reserve championship had not the aged boar class been of such a high standard.

The champion Large White sow was also bred by Messrs. Bidgood Bros. A sow exhibited by Messrs. Fairchild and Clutterbuck in the sow and litter class, was awarded the reserve championship ahead of the several mature dry sows.

Messrs. Fairchild and Clutterbuck and Mr. R. Young were successful in the stud Large White classes, and won first and second prizes respectively with their entries in the bacon-pig class which was judged on carcass appraisalment.

The Berkshires were a big improvement in numbers and quality over last year's exhibits, and included entries from two breeders in New South Wales. The most successful exhibitor of Berkshires was Mr. J. H. McCrum, who gained male and female championships and other prizes.

There was less variation in type among the Berkshires than in previous years, and the general type was not extreme in any

respect. It was a good light bacon-pig type with its flesh where grocers and shoppers like it. Mr. George Bedwell, of New South Wales, judged the Berkshires.

The Middle Whites were few in number, and some of their exhibits were small for their age, but the champion sow shown by Messrs. A. J. and R. Miller was a good specimen of the breed.

A feature of the pig show was the Large Black breed with a bigger entry of better pigs and two sows with litters of ten and twelve pigs were an indication of the productive capacity of this breed. Mr. Keaveny, of Queensland, judged the Large Blacks and the Wessex.

There was uniformly good quality among the Blacks. The male championship went to J. J. Coulthard's Fairview Vale Duke, while Mr. A. Kerger's Barbank Esquire 6th, took the reserve championship. Mr. J. T. Hamblin's sows took champion and reserve champion positions.

The Tamworths were somewhat irregular in type and quality, but included some very nice pigs, showing more body length than has been usual in this breed in the last few years.

Mr. A. Day, of South Australia, judged the Tamworths, and the awards were shared fairly evenly by most of the exhibitors.

The Wessex Saddlebacks made a good showing, and the fanciers of this relatively new breed to Australia were enthusiastic about its qualities as a farmer's pig.

The pork and bacon-pig classes were again well supported, which indicates that stud pig breeders realise the need for demonstrating that their pigs not only look good in the stud show, but cut up well as pork or bacon. Large White, Berkshire, Large Black, and Tamworth breeds were represented in these two commercial classes.

[L. A. DOWNEY, H.D.A., Pig Expert.]

FENCES

When erecting an all-purpose, seven-wire fence, posts of different lengths at different distances apart may be used; but 5-ft. 6-in. posts sunk 1 ft. 6 in. into the ground and 22 feet apart with two droppers in between make a good fence for holding both sheep and cattle. There is a difference of opinion as to the best distance apart to place the wires, but the gauge shown in the 5-ft.

6-in. post "B" in the diagram is most effective as it holds lambs much better than fences in which the lower wires are spaced 6 inches apart. The usual wiring is six plain wires with a barbed wire on top fastened by pieces of plain wire through the uppermost holes in the posts.

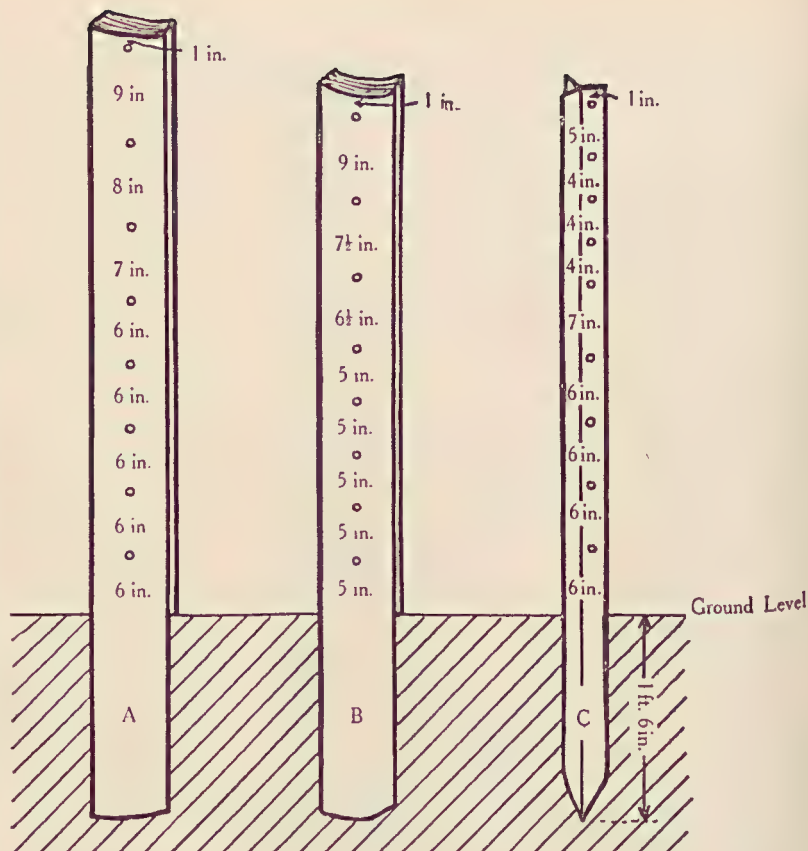
Post "C" is a steel-fencing post. These posts are very useful for temporary fences, and for erecting between wooden or concrete posts in permanent fences. A good combination in plain country is to erect one 8-in. by 4-in. wooden post to the chain with two steel posts and six droppers in between. Concrete posts may replace the wooden ones. Droppers should be split 3 inches wide by 1 inch thick, and hung 3 inches clear of the ground.

Post "A" is 6 feet long and the gauge of distances between wires is for posts sunk 1 ft. 6 in. in the ground. If sunk 2 feet in the ground the holes are bored as shown in post "B".

POULTRY BREEDING STOCK

A logical method of assessing the value of a bird or group of birds for breeding purposes is by progeny testing. Particular emphasis is placed on the male bird as he is usually mated to a number of females, and, while each hen represents only a small percentage of the breeding pen, the influence of the male is transmitted to every chick through each individual hen in his pen.

The presence of one or two mediocre hens in a breeding pen, although undesirable, may not have serious repercussions, but an inferior male bird can do a great deal of harm.



A.—A 6-ft. post 4 ft. 6 ins. out of the ground bored to a gauge that is commonly used.

B.—A 5-ft. 6-in. post 4 ft. out of the ground bored to a gauge found most suitable for sheep and cattle.

C.—A steel fencing post.

The most reliable method of assessing the value of a male bird is by progeny testing. Individual males are mated to groups of hens in separate pens. The eggs from each pen are marked and hatched in separate groups. The chicks are toe-punched according to the marking of the male birds and are reared together in their various age groups.

The value of the male as a sire is first ascertained by recording the fertility and hatchability of the eggs during the incubation period. Other important details, such as rate of growth, age when first egg is laid, body size, and percentage of mortality are also carefully noted. The young cockerels should be rigidly culled and the number of rejects by each sire tabulated.

Prior to laying, the pullets are sorted into their respective families and transferred to the laying sheds. Each family group is kept separate and egg production is recorded daily.

The pullets lay for approximately four to five months before the breeding season commences, which allows sufficient time to check the egg production of the various groups.

The value of the cockerels as potential breeders is ascertained by examining the complete history of each family.

Ability to transmit qualities that make for high egg production is of great importance, but the sire should also be capable of passing on sound constitutional vigour which will be reflected in a low mortality rate.

Birds selected for breeding purposes should conform as nearly as possible to the standard of the breed.

[M. D. HALL, Poultry Expert.]

POULTRY POPULATION IN ENGLAND

June returns show that the numbers of poultry in England are rapidly approaching the 1939 figure. Here is a comparison with the wartime and pre-war figures.

					Total Poultry.
1939.	..	..	..	..	56,426,000
1943	..	..	..	..	29,121,000
1947	..	..	..	..	41,060,000
1948	..	..	..	..	51,820,000

BOOK REVIEW

Breeding Livestock Adapted to Unfavorable Environments by Ralph W. Phillips, Head Animal Industry Branch Agricultural Division, Food and Agriculture Organization of the United Nations, 182 pages. (Australasian Representative—H. A. Goddard Ltd., 255A George-street, Sydney.)

A survey of work done in breeding animals suitable for different altitudes, wet and dry climates, arctic and tropical conditions, for special races of people living under primitive conditions, &c., is given.

The author points out that the majority of leaders in animal husbandry have devoted their investigations to areas where adaptability to rigorous conditions is of minor importance, and these leaders have taught most of the students from under-developed countries which are without adequate institutions of their own. He goes on to show that, if producers' stock are to perform profitably, animals adapted to the environment must be selected.

Different methods of sheep production throughout Great Britain and America are discussed, together with methods of improving the native sheep in places with climates as rigorous as Iceland, China, India, and Egypt.

The breeding of cattle to produce adequately in areas of high and humid temperatures is well covered, including the value of Zebu and Afrikaner cattle. It is shown that the Brown Swiss and Jersey cattle can withstand higher temperatures better than most other European breeds.

Many uncommon breeds of sheep and cattle, horses, pigs, water buffaloes, yaks, reindeer, camels, and dromedaries, llamas and alpacas, are dealt with, and the author concludes with some good practical advice on breeding methods.

A.C.T.H.

PORK AND BACON PIG CLASSES

Melbourne Royal Show, 1948

By A. D. NORTH, B.Agr.Sc., Science Field Officer

ENTRIES exhibited in the pork and bacon competitions at the 1948 Melbourne Royal Show were nine fewer than last year, but the average quality in both competitions was higher this year. The conditions of entry and methods of judging were similar to those of 1947.

A trophy valued at ten guineas was donated by Mr. J. M. Wilson, judge of the competition, and this was added to the £50 prize money for the six best bacon pigs. £33 was again distributed for the six best pork pigs.

Each entry consisted of a pair of pigs from the same litter. These were required to be within 25 lb. live weight of each other in the case of porkers, and 15 lb. in the case of baconers. One entry of bacon pigs was disqualified because it did not comply with this condition. The heavier pig of each pair was slaughtered; this having been determined by lot prior to weighing.

The carcass weights of the pigs had to be from 60 lb. to 100 lb. for the pork class and from 130 lb. to 200 lb. for the bacon class. The 36 entries—15 pork and 21 bacon—which complied with these conditions were appraised under the Hammond System. This system is fully explained in a pamphlet which may be obtained on application to this Department.

After judging, a whole side and a loin cut from the six prize winners in each class were exhibited in the refrigerated case in the Government Pavilion at the Showgrounds. Details of appraisal were given with the carcasses, and similar details were displayed over the living pigs in the pig pavilion.

The bacon class was the best exhibited to date. Only one entry scored less than 60 points and 13 scored 70 points or more. The average for the 21 entries was 70·6, in comparison with an average of 63·9 for the 27 carcasses appraised in 1947.

The average of the porker class was higher than the previous year. Only two entries scored less than 60 points, and the overall

average for the 15 entries was 65·4, compared with 61·9 for the 12 carcasses appraised last year.

The average points obtained in each section are set out in Table 1:—

TABLE 1.

	Possible Points.	Average for Porkers.		Average for Baconers.	
		1947.	1948.	1947.	1948.
By Inspection—					
Hams — well-filled and fine bone	8	4	4·1	4·9	6·5
Shoulders— .. light	7	4	5·4	3·5	5·5
Streak — thick, full of lean meat ..	12	7·8	6·1	9·5	6·3
By Measurement—					
Loin muscle— thick ..	28	14·1	15·7	20·6	22·6
Back fat thickness—correct proportions ..	20	15·2	15·0	12·9	15·0
Body length— in proportion to weight ..	20	15·7	17·9	9·5	11·7
Leg length— short ..	5	1·2	1·2	3·0	3·0
	100	61·9	65·4	63·9	70·6

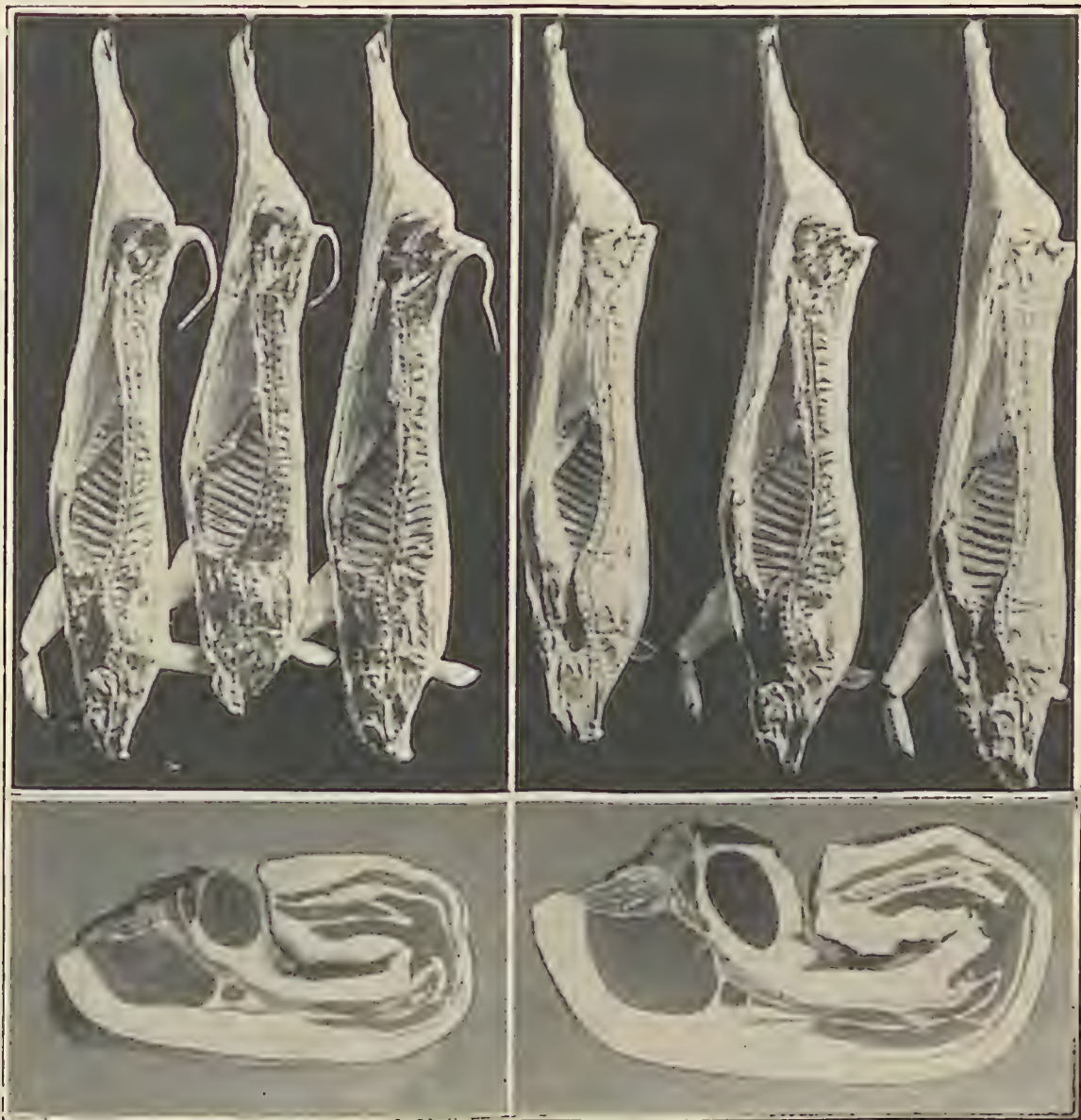
From the averages it will be seen that the leg length of the porkers was their weakest feature. This is further supported by the relatively low average score awarded for hams. The streaks in both classes scored poorly. The awards for fat were satisfactory, although it is an interesting point that fourteen of the porker carcasses were over-fat to varying degrees and one slightly under-fat.

With the baconers, however, thirteen were not quite fat enough, two had the optimum for their weight, and of the six which were over-fat, only one was really faulty in this regard.

The competitions were instrumental in bringing together some high-class porkers and baconers of various breeds. The pork exhibits were made up of 10 Large Whites, 2 Tamworths, 1 Large Black, 1 Berkshire, and 1 Berkshire x Large White. The bacon class contained 2 Berkshires, 1 Large Black, and 18 Large Whites.

The competitions should help breeders in the production of pigs which will produce the type of carcass housewives prefer. They should provide also some further useful information on the quality of their breeding stock.

The average growth rate of some of the prize-winning pigs was not fast, and breeders should improve on this point in subsequent competitions. Growth rate is very important from a commercial point of view.



Above Left :—The winning porker carcasses. Right to Left—L. H. Castle's Large White, first ; B. Whelpton's Berkshire, and Fairchild and Clutterbuck's Large White, equal second. The loin cut of the first prize winning porker is shown below the porker carcasses. This pig scored the equivalent of 95 per cent. for fat, 67·8 per cent. for loin muscle, and 75 per cent. for streak.

Above Right :—The winning baconer carcasses. Right to Left—Fairchild and Clutterbuck's Large White, first ; R. Young's Large White, second ; and I. E. and F. Hawtin's Large White, third. The loin cut of the first prize winning baconer is shown under the bacon carcasses. This pig scored the equivalent of 85 per cent. for fat, 100 per cent. for loin muscle, and 70·8 per cent. for streak.

Bacon Pig Competition, Melbourne Royal Show, 1948.

Breeder's Name.	Breeding of Pigs.	Age.	Live Weight.	Carcass Weight.	Points.	Place.
		days.	lb.	lb.		
Fairchild and Clutterbuck	S. Para Wirra Lucky 29th	248	246	179	86	1
	D. Vacluse Duchess 217th (Large White)					
Young, R. ..	S. Gumbank Renown 22nd	171	228	167	83	2
	D. Vacluse Vanity 319th (Large White)					
Hawtin, I. E. and F.	S. Highfields Prince 2nd	215	172	131	82	3
	D. Rossmoyne Amy 121st (Large White)					
Cockbill, W. ..	S. Histon Eastern Lad (Imp.) ..	225	199	148	77	= 4
	D. Vacluse Duchess 219th (Large White)					
Whyteross, D. ..	S. Vacluse Premier 36th	260	255	197	77	= 4
	D. Eastside Maid 150th (Large White)					
Fairchild and Clutterbuck	S. Para Wirra Lucky 29th	175	205	148	75	6
	D. Vacluse Belle 104th (Large White)					
Trenery and Soderlund	S. Longerenong King 86th	253	229	169	74½	7
	D. Promview Engeline 267th (Large White)					
Richards, A. H. ..	S. Patterdale Felix	248	272	190	74	8
	D. Somersleigh Doris (Large White) ..					
Buller, R. A. ..	S. Green Acres King 21st	230	209	159	73½	9
	D. Green Acres Superior 11th (Large White)					
Cockbill, W. ..	S. Histon Eastern Lad (Imp.) ..	203	216	163	73	10
	D. Histon Brocade 38th (Imp.) (Large White)					
Trenery and Soderlund	S. Longerenong King 86th	253	193	139	72½	11
	D. Promview Engeline 267th (Large White)					
Hawtin, I. E. and F.	S. Highfields Prince 2nd	213	213	157	72	= 12
	D. Rossmoyne Amy 90th (Large White)					
Williams, A. W. and S.	S. Hill View Glen Primus 2nd ..	169	219	169	72	= 12
	D. Hill View Glen Joan (Berkshire) ..					
Castle, L. H. ..	S. Clarendon Matador 7th	193	189	148	66½	= 14
	D. Clarendon Linda 12th (Large White)					
Castle, L. H. ..	S. Clarendon Matador 7th	193	218	170	66½	= 14
	D. Clarendon Linda 12th (Large White)					
Kerger, A. C. ..	S. Toolleen Montie 3rd	187	247	189	66½	= 14
	D. Barbank Lady Elite 5th (Large Black)					
Cornell, J. ..	S. Rose Valley Prince 23rd	206	215	170	65	= 17
	D. Patterdale Sardis Excel (Large White)					
Williams, A. W. and S.	S. Hill View Glen Primus 2nd ..	188	222	177	65	= 17
	D. Hill View Glen Jean (Berkshire) ..					
Buller, R. A. ..	S. Green Acres King 21st	259	224	179	63½	19
	D. Green Acres Glorious 12th (Large White)					
Cornell, J. ..	S. Rose Valley Prince 23rd	206	237	180	60	20
	D. Patterdale Sardis Excel (Large White)					
Osborne, L. R. ..	S. Green Isle Stalin 4th	157	196	150	38	21
	D. Vacluse Vanity 282nd (Large White)					

The Porker Competition.

Breeder's Name.	Breeding of Pigs.	Age.	Live Weight.	Carcass Weight.	Points.	Place.
		days.	lb.	lb.		
Castle, L. H. ..	S. Cefn Wonder 75th ..	144	138	100	79½	1
	D. Clarendon Linda 5th (Large White)					
Fairchild and Clutterbuck	S. Vaulcuse Eastbury 53rd ..	123	134	89	73	= 2
	D. Vaulcuse Vanity 321st (Large White)					
Whelpton, B. ..	S. Belmont Royalette 6th ..	114	127	89	73	= 2
	D. Meadowvale Utility Rose (Berkshire)					
Young, R. ..	S. Para Wirra Lucky Major	103	105	71	72½	4
	D. Gumbank Amy 2nd (Large White) ..					
Bidgood Bros. ..	S. Staghorn Baconer ..	118	116	77	72	5
	D. Strathfield Maiden (Large White x Berkshire)					
Trenery and Soderlund	S. Gumbank Sergeant Major ..	121	107	73	71½	6
	D. Promview Engeline 225th (Large White)					
Hawtin, I. E. and F.	S. Rossmoyne Knight 19th ..	124	111	69	69	= 7
	D. Rossmoyne Maiden 128th (Large White)					
Richards, A. H. ..	S. Patterdale Felix ..	121	123	90	69	= 7
	D. Somersleigh Dot 4th (Large White)					
Young, R. ..	S. Gumbank Renown 22nd ..	110	126	89	68½	9
	D. Gumbank Amy 8th (Large White) ..					
Trenery and Soderlund	S. Gumbank Sergeant Major ..	119	92	61	66	10
	D. Promview Engeline 232nd (Large White)					
Butler, J. H. ..	S. Veradale Douglas ..	114	100	65	65½	11
	D. Meadow Banks Priscilla (Tamworth)					
Cornell, J. ..	S. Clarendon Matador 4th ..	121	124	86	65	12
	D. Rose Valley Princess 38th (Large White)					
Kerger, A. C. ..	S. Toolleen Montie 3rd ..	128	113	80	62	13
	D. Barbank Lady Elite 12th (Large Black)					
Butler, J. H. ..	S. Veradale Douglas ..	144	120	88	46	14
	D. Meadow Banks Princess (Tamworth)					
Cornell, J. ..	S. Clarendon Matador 4th ..	121	126	89	29	15
	D. Rose Valley Princess 38th (Large White)					

“Pig Raising Illustrated”

A new edition of a very useful and informative book for pig-raisers has just been published. The book, “Pig Raising Illustrated,” written by L. A. Downey, H.D.A., the Department's pig expert, deals with every aspect of the industry—accommodation, breeds, feeding, and health. Each point is brought out clearly by the liberal use of plans and pictures. Printed in a distinct, easily-read type on good quality paper, the book is proving very popular with pig-raisers and farmers in general. The publication may be obtained on application to the Director, Department of Agriculture, Melbourne, at a cost of 2s. 6d., post free.

Passion Fruit Growing in North-Eastern Victoria

By I. E. EBBOTT, Orchard Supervisor

IN 1924, an experimental plot of approximately one acre and a half of passion fruit vines was planted by Mr. J. Challis at Lurg, approximately seventeen miles east of Benalla. Mr. Challis had just returned from a working tour of New South Wales where, in the course of his travels,

Some of the local farmers were sceptical of success but their gloomy prophecies proved incorrect, as the plants lived and grew into vines which produced excellent fruit of good size and quality.

The vines were planted on the slopes of hills with a north-easterly aspect, and with the rows running north-east and south-west. This allowed the early morning sun to shine on both sides of the vines for about two or three hours each morning.

The idea was to encourage the bees to work on both sides of the vines to pollinize all the flowers. This was essential if the vines were to produce to their full extent.

A lack of fruit had been noticed on the shady side of the vines,



Young passion vines growing at Lurg, showing method of trellising used.

he had observed passion fruit growing on a commercial basis. He considered that the climatic conditions in the passion fruit growing areas of New South Wales which he visited were similar to those at Lurg, and the soil conditions also seemed to be the same. As a result of these observations, Mr. Challis decided to plant a few vines at Lurg and see how they progressed. If successful, he would extend his plantings and make his experimental venture a commercial one. Seedlings were obtained from Hastings, on the Mornington Peninsula, and 120 vines were planted out.



Passion vines at Lurg. Two-year-old vines planted on 18 ft. by 12 ft. system, with a trellis of four wires. The top wire is 5 ft. 6 in. high.

where they had been planted from east to west and where the south side of the vines were shaded all day. Where vines are planted in lines running north and south, the west side of

the vines are lightly set in comparison with the east side, which obtains the benefit of the early morning sun. This indicates that vines planted in rows running in a north-easterly direction gain an advantage from the morning sun which, by attracting the bees, assists in the pollination of flowers.

After a lapse of three years, when the vines were flourishing, Mr. Challis extended his plantings by a further three acres. Two years later he added a further plot of four acres.

By this time, local farmers began to take notice of the new vineyard, and, deciding that it was a payable proposition, Mr. H. Gardner, of Lurg, planted out three acres of vines. These flourished also and were followed by plantings by other farmers in the district.

Since then, still further plantings have been made until now there are more than 120 acres of passion fruit vines in first-class order and in full bearing.

Most of the plantings are of small areas averaging about six acres. These vineyards for the greater part are in excellent health, young, and in full bearing. A few have passed their prime and are on the way out, but young vineyards are being planted to replace the old vines as they reach the end of their useful life.

The industry later spread to the Warby Ranges in the Wangaratta district, where several orchardists planted out vineyards

of passion fruit. Some of these are still producing, but most of the plots were grubbed out after several years of profitable life. Some have planted new vineyards in fresh soil, and these at present are in very good condition.

Several of the citrus growers in the Warby Ranges planted passion fruit between the rows of young citrus trees, but these were removed as the trees grew. This, however, did not always prove to be a wise thing to do, as the citrus trees have not done as well as those which were not interplanted with passion fruit.

Both citrus and passion fruit are surface feeders and this had a detrimental effect on the citrus in this non-irrigated district. However, the passion fruit vines were profitable and provided some income before the citrus came into bearing.

LIFE OF VINES

To give some indication as to the longevity of the vines in the north-eastern district, there are some vineyards still producing fair crops at the age of fourteen years. Admittedly these are not as prolific as in former years, but the fruit is of good quality and size. However, fourteen years is usually considered to be the maximum life of the vines at Lurg.

SOILS

The soils at Lurg are totally different to those in the Warby Ranges, with the one exception that both are naturally well drained. The soil at Lurg is a shale soil with an abundance of rubble, which makes cultivation extremely difficult and also is very wearing on implements.

In the Warby Ranges, the soil is a red granitic loam, deep and well drained. It holds moisture well and the vines rarely suffer during the summer months through lack of water.

Plantings of passion fruit should always be made in new soil. Some growers have tried replanting in the old sites with little, if any, success. It would be possible, perhaps, to restore



Two-year-old passion vine in the Warby Ranges.

the soil by green cropping and spelling it for six or seven years, but even then the amount of humus replaced in the soil would not be sufficient to last out the life of the vines.

RAINFALL

The average annual rainfall at both Lurg and Wangaratta is about 26 inches per annum, so it is essential that as little water as possible should be allowed to run to waste, by planting and cultivating across the hillsides.

MANURING

Leaf mould and fowl manure appear to be the best manurial treatments for passion fruit. Leaf mould, spread on the ground fairly heavily, and then lightly disced in, has a noticeably beneficial effect on the vines.

TRELLISING

The trellising and method of training the vines in the Lurg district are very simple. The trellises are usually about 6 or 7 feet high, having from three to five wires; the end posts are "stayed", and vines are planted with two vines between posts. Generally, plantings are on the 12-ft. x 12-ft. or 12-ft. x 14-ft. system. Rows are 12 feet apart, vines 12 or 14 feet apart. In some cases, the vines have been planted 18 feet apart, but it was found that 14 feet was far enough. Vines then will join up quicker and afford protection for each other. The vineyards need as much protection from wind as possible.

The vines are trained on the fan system. By this method, several of the strongest shoots from the ground are trained fanwise on the trellis.

There are good possibilities for the expansion of the industry in the north-eastern district. The climate is suitable in both the Lurg and the Warby Ranges areas, although the frost problem is a fairly serious one. In both places, however, the vineyards are planted fairly high up in the hills, where the frost is not so heavy. Once the vines are established, they seem to be able to withstand a light frost.

The soil is apparently suitable for passion fruit and there is ample land for more plantings to be made.

The marketing of the fruit presents no obstacles, and prices have been high enough to tempt new growers. In addition to the fresh-fruit market, there is a big demand from processors of passion fruit. However, the growers themselves say they cannot plant out any more than they have at present owing to the scarcity of labour, which admittedly is a problem. Six to eight acres of vines are as much as one man can handle without outside help, and even then an extra man would be desirable.

Several growers in Lurg and Warby Ranges districts intend planting additional acreages this year, and the additions will probably amount to approximately 40 acres for the two districts.

Most vineyards are planted with Black Passion seedlings. Last season a few experimental plantings were made of the grafted vines. These were Black Passion grafted to Banana Passion stocks, but, up to date, little success has been met in the Lurg district with the use of the grafted variety.

Tree Bandages for Codling Moth

Of all the methods subsidiary to spraying for codling moth, one of the most useful is that of attaching bands around the trunks of apple and pear trees to trap grubs leaving the fruit. This reduces the number of moths emerging from later broods. The corrugated cardboard chemical bands are suitable for smooth bark trees, but, in some districts, they suffer from the disadvantage that they are destroyed by birds in search of grubs. Bag bandages require more attention, as it is essential to remove them at least every ten days to destroy grubs. However, bag bandages usually trap more grubs than chemical bandages, and are more suitable for use on gnarled, rough-barked pear trees, where grubs can secrete themselves away from contact with the chemical in the corrugated cardboard bandages.

Bands should be attached to the tree trunks by the last week in November.

[Contributed by the Horticultural Division.]

LOWER LEAF SCORCH OF FLAX

By C. R. Millikan, M.Agr.Sc., Senior Plant Pathologist

An undescribed disease of flax which has been given the name of "lower leaf scorch" has occurred in widely-separated areas in the Western, Central, and Gippsland districts of Victoria during each of the seven seasons from 1942 to 1948 inclusive. No definite reports of the disease have yet been obtained from the other flax-growing States of Australia, although it has probably occurred in Tasmania and in Western Australia (Cass Smith 1948).

OCCURRENCE IN VICTORIA

The disease first becomes apparent in late August or early September, and may gradually increase in severity until about the middle of October, after which affected plants tend to "grow out" of the condition.

The soils concerned are acid loams to clay loams (approximately pH 4.5 to 5.2), often containing buckshot. They have usually not been previously under cultivation, or have been under pasture and weeds for a considerable number of years before being broken up and sown immediately to flax. The soil thus contains a considerable amount of decaying sod when sown, and the first crop after such pasture may show considerable lower leaf scorch, whereas, if the same area is re-sown to flax the following year, there may be much less of the disease in this second crop.

A notable feature of the occurrence of the disease in the field is that, while in many cases it may occur in well-defined patches or be evenly distributed throughout the crop, in some instances it has been confined to small lengths of individual drill rows, while plants in adjacent rows appear quite normal. In one case at Gisborne, almost all the plants in one particular row of each drill width throughout the whole area of the crop (some 20 acres in extent) were severely affected with lower leaf scorch, whereas the great majority of the plants in

the remaining rows were healthy (Fig. 2). From the results described below, it is evident that this latter phenomenon was related to an uneven distribution of superphosphate by the drill. In the case quoted above, it was found later that the pin was broken in the particular manure star of the drill.

Where the disease occurs in well-defined patches there is evidence that the soil pH value is lower and the soluble manganese higher in such patches than in the surrounding soil on which the apparently normal plants are growing. This is illustrated by the following results of determinations made by the Agricultural Research Chemist on soil samples taken from a flax crop at Streatham in 1947.

Sample.	pH.	Soluble Manganese, (Mn). p.p.m.
Soil in which healthy plants were growing	5.5	50
Soil in which affected plants were growing	4.9	94

Plants affected with lower leaf scorch usually occur in soil adequately supplied with moisture.

SYMPTOMS

Plants may show symptoms at any stage of growth up to approximately 12 inches in height. Growth becomes very stunted, and affected plants show a slight chlorosis which may sometimes not be readily discernible in individual plants, but which is easily seen in affected plants in the mass. Occasionally, very dwarfed plants showing marked chlorosis of the top have occurred. Concurrently with the development of the chlorosis, the lower leaves become necrotic (Fig. 1).



Fig. 1.—Lower Leaf Scorch of flax plants grown in the field, showing the characteristic necrosis of the lower leaves commencing at the tips. The severely affected plants on the right have produced secondary shoots which are chlorotic.

The first signs of the necrosis usually occur either at the ultimate tip, or very close to it, on one or both edges of the leaf. However, it is not uncommon for the necrosis to appear about the middle of the edges of the leaf, or as spots distributed over the distal half of the leaf area. In other cases the necrosis may commence in the form of an ill-defined, greyish-green, collapsed area at the tip of the leaf.

In all cases the necrosis finally becomes light-brown in colour, and extends and coalesces until most of the distal half of

the leaf is affected. It is characteristic that the non-necrotic portion of the leaf remains relatively normal green in colour.

In mildly-affected plants, leaves in the central portion of the stem may be the only ones affected by the necrosis. In severer cases most of the lower leaves may ultimately become involved, while in very severely-affected plants all leaves, including the growing point, may die, in which case, secondary shoots may be formed from the crown node (Fig. 1). Such secondary shoots on severely-affected plants are often very chlorotic.

The stems of affected plants occasionally show brown discolourations in association with the diseased leaves.

In the late spring flax plants affected with lower leaf scorch appear to "grow out" of the condition, although their final height is usually not as great as that of unaffected plants. Diseased plants are also later than healthy plants in reaching maturity.

SURVEY OF LITERATURE

Manganese—molybdenum Antagonism

Lower leaf scorch symptoms in flax resemble those of magnesium deficiency (Millikan 1944) so that the disease appears to be similar in nature to that of bean scald (Parbery 1943, Anon. 1944) which is associated with an excess of manganese in the affected bean plants, although the symptoms manifested by such plants resemble those of magnesium deficiency.

The relation of lower leaf scorch to excessive manganese absorption is indicated by the results of water culture experiments conducted by Millikan (1948). These showed that symptoms which appeared identical with those of lower leaf scorch, could be induced in flax by the addition of excessive amounts of manganese to the substrate. Zinc toxicity will also induce somewhat similar symptoms in flax (Millikan 1947A).

It has been further demonstrated (Millikan 1947C) that an antagonism exists in the flax plant between molybdenum on the one hand, and certain heavy metals including manganese on the other. Thus the severity of manganese-induced iron deficiency chlorosis and lower leaf necrosis was reduced by increasing the concentration of molybdenum in the nutrient solution.

The significance of this manganese-molybdenum antagonism under highly acid-soil conditions is discussed.

Soil Management

In Victoria, lower leaf scorch has been most prevalent in the first flax crop grown on acid (pH 4.5 to 5.2 approximately) virgin soil, or on ley ground which has not been under crop for many years. A second crop in the next year may show considerably less of the disease. With the first crop the common practice has been to plough up the land and sow immediately.

As a result, the soil has usually contained considerable amounts of decaying sod when seeded to flax. McCool (1934) has demonstrated that, in soil containing such decaying sod, there is an accumulation of manganese in the top soil. In acid soils these manganese ions formed during moldering were stated by Endredy (1940) to be mobile until they reach layers in which the pH is above 7 or significant amounts of calcium carbonate are present. Soils higher in humus also showed higher contents of exchangeable manganese.

Cultivation decreased the amount of exchangeable manganese in the soil. Active organic matter in the soil can reduce the insoluble higher oxides of manganese to the bivalent form, particularly under strongly acid-soil conditions (Leeper 1947). Cultivation would decrease the reserve of this active organic matter in the soil, and so decrease the amount of bivalent manganese produced from the higher oxides. This is probably one of the reasons for the improvement referred to above in the second crop following severe lower leaf scorch in the first.

It is apparent from the work of Leeper, and Swaby (1940) on certain Victorian and other soils, that when the pH of the soil is above 5.5 fixation of manganese may take place. This is brought about at or above this pH by the microbial oxidation of the bivalent manganous ions to manganic oxide.

Hibbard (1940 (a) 1940 (b)) also demonstrated that in soils where vegetable debris had accumulated for many years as a result of long persistent vegetative cover, available zinc and other so-called minor elements (e.g., Cu, Pb, Ni, Co.) were high in the top soil. He thus obtained support for the hypothesis that vegetation extracts minerals from the soil, then, after the minerals are returned to the soil in decaying vegetation debris, they accumulate in the top soil, instead of being uniformly distributed throughout the whole mass as it originally existed.

The above work affords an explanation for the beneficial effects on crop yields which usually follows the practice of ley farming in Victoria (Hayman 1945); and of the results reported previously by different workers on the alleviation of zinc deficiency by cover cropping (Ballard and Lindler (1934), Hoagland (1937)) or "land resting" (Barnette and Jones (1934), Barnette et al (1936), Rogers, Gall, and Barnette (1939)).

From the foregoing it seems evident that in ley ground with a persistent vegetative cover, there may be an accumulation of certain minor elements, notably manganese and zinc, in the surface soil. This has great significance in Victoria where the common practice has been to plough up grassland for flax. Many of the flax soils are clay loams which are poorly drained,

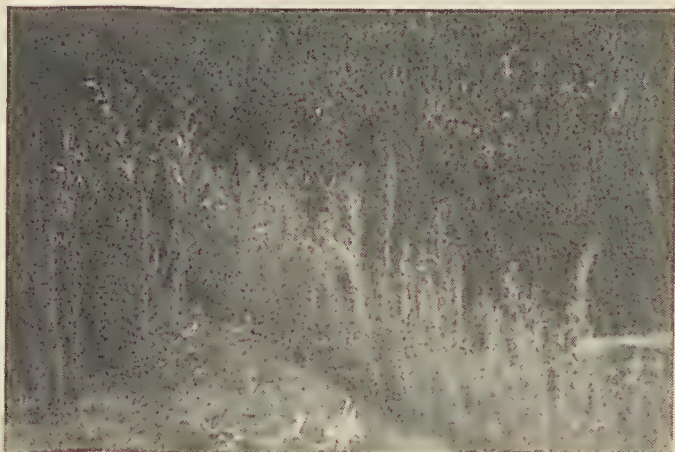


Fig. 2.—Close-up view of a crop at Gisborne in 1947 showing portion of an individual drill row which did not receive superphosphate due to a broken manure star in the drill. Plants in this row were dwarfed, chlorotic, and severely affected with Lower Leaf Scorch. Plants in adjacent rows appeared quite normal. Healthy plants were removed from rows in foreground before photograph was taken.

and such soils usually contain a greater proportion of minor elements than soils having good drainage (Rogers et al 1939).

Soil Reaction

The acid nature of the soils on which lower leaf scorch of flax occurs (they vary from approximately pH 4.5 to 5.2) would also tend to aggravate the effects of any manganese and zinc accumulations. A number of workers, including Olsen (1934, 1936), Wallace et al (1945), Fried and Peech (1946), and Hale and Heintze (1946) have concluded that the amount of manganese compounds in strongly acid soils plays an essential role as a growth inhibiting factor. Olsen showed that the manganese content of plants growing on soils of varying acidity increased with the hydrogen ion concentration of the soil, and results of water culture trials indicated that this is due to a higher concentration of manganese in the soil water in the acid soils. It was also shown that plants are able to absorb more manganese in an acid solution than in a neutral solution. This was confirmed by Chapman et al (1939) who grew citrus in the same solution adjusted to pH 5 and pH 7 respectively. The manganese content of the leaves of the plants at these two pH levels were:—

	pH 5	pH 7
Mn content	20 p.p.m.	7 p.p.m.

These observations have also been supported by the work of Leeper (1934, 1947).

The alleviation of the toxic effects of excess manganese in the soil by liming have been reported by a number of workers, including Parbery (1943), Wallace et al (1945), and Fried and Peech (1946). Reference has been made above to the work of Leeper and Swaby (1940) on the effect of soil reaction on the microbial fixation of manganese.

The availability of manganese in the soil is increased by acidification with sulphur (Piper 1931, Leeper 1935, 1940). Parbery (1943) and Kipps (1947) reported that sulphur increased the uptake of manganese by bean and lucerne plants respectively, and aggravated the symptoms of manganese toxicity.

The effects of soil reaction on zinc availability parallel its effect on that of manganese described above. The literature on this subject has been summarized by Millikan (1947A).

The effect of soil reaction on molybdenum availability is the reverse of its effect on the availabilities of manganese, and zinc outlined above, i.e., molybdenum becomes more available in passing from acid to alkaline soil conditions (Stephens and Oertel 1943, Lewis 1943). Waring et al (1947) showed that sulphuring the soil increased the incidence of whiptail disease of cauliflower. However, the application of 1 lb. per acre of sodium molybdate virtually prevented the occurrence of the disease on the sulphured areas. Attention has been drawn to the similarity between whiptail disease and manganese toxicity symptoms by Millikan (1947c). He also discusses the significance of the high availability of manganese and the low availability of molybdenum in relation to the injury which occurs in certain plants growing on highly acid soils.

Calcium-manganese Antagonism

The effects of liming on the manganese status of plants may be two-fold:—(a) increasing the soil pH and concomitantly reducing the availability of manganese and certain other elements. This aspect has been discussed above; (b) improving the calcium status of the soil.

The importance of the second of these effects is indicated by the results of Swanback (1939) with tobacco, which suggest that an antagonism exists between calcium and manganese in their absorption. Increasing calcium concentrations were found to reduce the intake of manganese and its translocation to the leaves. Conversely, Fried and Peech (1946) found that excessive manganese absorption reduced the uptake of calcium.

Similarly, Wallace et al (1945), working with beans and cauliflower, and Kipps (1947) with lucerne, have also observed that the severity of manganese toxicity symptoms were considerably reduced by increasing the calcium status of the plants.

Soil Waterlogging

It has been shown (Millikan 1944) that, in the same types of soil on which flax shows lower leaf scorch disease, waterlogging at a certain stage in the development of the flax plant will induce "wither-top" (calcium deficiency) disease. It is evident, therefore, that excess water decreases the availability of the soil calcium

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to the plant. Concomitantly with this decrease in calcium availability, it is very probably that other elements, notably manganese and zinc, became more available to the plant. Thus the existence of a calcium-manganese antagonism as described above would be an important factor in plant nutrition under waterlogged soil conditions.

Piper (1931), Leeper (1935, 1940, 1947), and Gallagher and Walsh (1941) have all found that normal growth may be obtained on soils deficient in available manganese by temporary waterlogging. This effect is due to biological reduction by anaerobic bacteria which use the higher oxides of manganese as a source of oxygen, and so liberate bivalent manganous ions (Mann and Quastel 1946, Leeper 1947). This type of reduction can take place at any pH. Leeper (1947) has reported that the beneficial effects on the growth of oats, of four weeks waterlogging of a manganese deficient soil, lasted for at least eleven years.

The results of McCool (1934) and Wain et al (1943) also showed that waterlogging increased the amounts of extractable manganese in soil.

Similarly, it has been claimed by Schropp and Arenz (1941) that zinc and boron are more available to the plant under excessive water supply than under deficient water supply.

Soil Sterilization

Sterilization with steam has two effects, one chemical, the other biological, while the effect of formalin is only biological.

Zinc and manganese availability is increased by soil sterilization. Thus, Ehrenburg (1910) observed that the injurious action of zinc in some soils was increased by sterilization, while on zinc deficient "little leaf" soils, sterilization with steam, formaldehyde or ether was found by Ark (1937) and Hoagland et al (1937) to prevent the development of zinc deficiency symptoms in maize and fruit trees.

"Grey speck" (manganese deficiency) of oats is also prevented by soil sterilization (Samuel and Piper (1928)). Sterilization, therefore, results in an increase in the amount of manganese in the soil extracts

(McCool (1934), Piper (1942), Wain et al (1943)). McCool showed further that plants grown in steam-sterilized soil contained much larger amounts of manganese, and may develop leaf characteristics similar to, if not identical with, those produced in soils to which excessive amounts of manganese had been applied. Similarly, Kipps (1947) reports a four-fold increase in manganese in lucerne as a result of steam sterilization of the soil. The plants showed extreme symptoms of manganese toxicity. There was, however, no corresponding increase in total iron.

Piper (1942) has further shown that the increase in the availability of manganese resulting from heat sterilization was much greater than the corresponding increase in the availability of copper.

Superphosphate

The reported influence of phosphates on the manganese and zinc status of plants is of particular interest, in view of the results of experiments to be described below. Further, on molybdenum responsive soils, applications of both phosphate and molybdenum appear to be necessary for normal growth of subterranean clover (Anderson and Oertel 1946). Without molybdenum, phosphate caused little improvement in growth. No molybdenum (less than 1 p.p.m.) was detected in the superphosphate which they used.

On the other hand, Trumble and Ferres (1946) report that some grades of superphosphate were more effective than others in promoting growth on molybdenum-deficient soils. They suggested that the more effective grades contained significant amounts of molybdenum impurities. More recently, Oertel and Stace (1947) have confirmed that different superphosphates do contain varying amounts of molybdenum, depending on the source of the phosphate rock used. They concluded that, in certain cases, the amounts present may be significant on molybdenum-deficient soils, as only very small amounts of molybdenum are required for improving growth on such deficient soils. Thus Anderson (1946) obtained responses following the application of as little as $\frac{1}{16}$ oz. per acre of molybdenum tri-oxide under field conditions.

The increase in the intensity of the green colour of plants treated with superphosphate, such as occurred in the flax experiments described below, is also suggestive of the presence of molybdenum impurity. Phosphate deficient plants are normally darker green in colour than those receiving an adequate supply of this element (McMurtrey 1938, Millikan 1944). Further, an increase in phosphate without any added molybdenum has been found to increase the severity of manganese induced iron chlorosis in plants growing on highly acid substrates containing large amounts of soluble manganese (Millikan 1948). On the other hand, it has been well established by a number of workers, that small quantities of molybdenum applied to highly-acid molybdenum deficient soils will increase the intensity of the green colour of plants. This colour change is due to a molybdenum-manganese antagonism resulting in an improvement in the iron status of the plant (Millikan 1947c).

From the above it appears evident that, due to the presence of molybdenum impurities in the superphosphate used, the interaction between phosphate and molybdenum for normal growth described by Anderson and Oertel (1946) may have an important bearing on the marked growth responses of flax to superphosphate, which occurred in experiments reported below with lower leaf scorch soils.

The presence of a significant amount of molybdenum impurity may also have been an important factor concerned in the report from New South Wales (Anon 1911) that superphosphate almost fully corrected the toxic condition of soils in which an excess of manganese (0.24 per cent. Mn_2O_3) had completely killed grass, and of Bortner (1935) that manganese chlorosis in tobacco was more or less prevented by superphosphate. This appears likely in view of the results of experiments with water cultures (Millikan 1947c), and those described below, in which it is shown that small amounts of molybdenum will considerably reduce the injury in plants normally resulting from heavy dressings of manganese sulphate. Eisenmenger and Kucinski (1940) obtained some indication that the application of manganese to the soil may actually increase the amount of phosphorus in crops.

The relationship between zinc and phosphorus has also received some attention from workers, whose results have been recently summarized (Millikan 1947b). It has been shown that heavy applications of phosphate will induce zinc deficiency symptoms in plants. Conversely, heavy applications of phosphates would be expected to assist in alleviating the effects of excess zinc.

Ammonium Sulphate

In a flax-manurial experiment at Drouin in 1942, it was observed by the writer that lower leaf scorch was aggravated by treatment of the plants with sulphate of ammonia. It appears evident that this increase in the severity of the disease was due to the effects induced by sulphate of ammonia on the manganese status of the plants so treated.

It has been reported by Samuel and Piper (1928) and Leeper (1947) that "grey speck" (manganese deficiency) of oats was ameliorated by ammonium sulphate or chloride. It was concluded that these acid ammonium salts made manganese more available to the plant.

It was further shown by McCool (1934) that superphosphate plus sulphate of ammonia actually did increase the manganese content of soil extracts. Similarly, Hopkins et al (1944) investigated a condition of pineapples associated with excessive manganese absorption, and found that the continued use of sulphate of ammonia lowered the soil pH and resulted in the development of considerable amounts of soluble manganese in the soil.

The increase in soil acidity resulting from the use of sulphate of ammonia may also result in an appreciable reduction in the molybdenum content of plants (Lewis 1943, Anderson and Oertel 1946). On the other hand, nitrate of soda increased the soil pH and probably increased the availability of molybdenum.

Waring et al (1947) report that whiptail disease in cauliflower may be aggravated by heavy dressings of sulphate of ammonia, and prevented by a small application of sodium molybdate.

Potassium Sulphate

Potash has been reported to have a depressing effect on the manganese content of plants by Gallagher and Walsh (1941), who found that the severity of manganese deficiency symptoms in oats was considerably lessened if potash was omitted from the manure.

Sodium Chloride

Nicholas (1944) reports that the manganese status of plants growing on acid soils may be considerably increased by the application of sodium chloride, due to ion exchange.

Further instalments of this paper will appear in subsequent issues of the Journal.

Burnley Egg-Laying Competition

Progress Totals

The number of first-grade eggs laid to 21st October, 1948, by the leading fowls in each class of the Burnley Egg-laying Competition, together with the names of the birds' owners, are set out in the following tables. The tests, which are being conducted at the School of Primary Agriculture and Horticulture, Swan-street, Burnley, commenced on 1st April, 1948, and will conclude on 2nd March, 1949, a period of 336 days. First-grade eggs, during the first two months of the competition, must weigh not less than $1\frac{3}{4}$ oz. and not less than 2 oz. thereafter.

Pen No.	Competitor.	Total First Grade Eggs.
---------	-------------	-------------------------

Class 1.—White Leghorns—Wet Mash.

147	Hill, H. E.	184
146	Goddard and Harvey	183
142	Gibb's Highway Stud	176
128	Abikhair, Les	173
160	Lowe, G. R.	169
154	Sunridge Poultry Farm	163

Class 2.—White Leghorns—Dry Mash.

235	Skinner, A. A.	172
229	Moran, G.	171
205	Clements, W. H.	167
230	Moran, G.	163
216	French, R. E.	157

Class 3.—Light Breeds, other than White Leghorns—Wet Mash.

105	Doull, J. (Legbars)	143
126	Woollett, C. J. (Legbars)	142
104	Chalmers, H. L. (Legbars)	137
119	"Glenyuille"	132
115	Kemp, H. L. (Legbars)	131
120	"Glenyuille"	130

Pen No.	Competitor.	Total First Grade Eggs.
---------	-------------	-------------------------

Class 4.—Australorps—Wet Mash.

35	Paton, W. S.	184
31	Hanson, S. H.	173
4	Beswick, A. G.	171
7	Caspar, A. and L.	170
16	Davis, E. C.	162
10	Clark, F. A.	162
11	Cumming H. D.	162

Class 5.—Rhode Island Reds—Wet Mash.

76	Fraser, D. R.	160
98	Wear, J.	152
80	Grenville Stud Poultry Farm	149
71	Cropley, H. J.	148
63	Seven Acres Poultry Farm	145
89	Mills, J. J.	142

Class 5.—All Heavy Breeds, other than Rhode Island Reds and Australorps—Wet Mash.

54	Cocking, W. (Light Sussex)	118
58	Lang, J. (Langshan)	108
57	Lang, J. (Langshan)	103
56	Wilkinson Bros. (Light Sussex)	100

ASSOCIATION HERD TEST—(continued from page 494).

HERDS OF 20 TO 39 COWS.

Owner.	Association.	Cows.	Butterfat.
H. McLean ..	Leongatha District No. 1	20	446
A. W. Hasthorpe	Narracan Shire No. 1	31	440
T. A. Dickie ..	Katandra West No. 1	20	433
K. McLean ..	Leongatha and District No. 1	24	427
T. McNicol ..	Tongala No. 2	32	415
J. A. Warnock ..	Swanpool No. 1	31	414
W. Renkin ..	Swanpool No. 1	25	414
T. Gaw ..	Bass..	37	413
A. E. Jeffries ..	Kongwak No. 1	21	409
R. A. Seabrook ..	Korumburra No. 1	36	409
H. W. Burgman..	Katandra West No. 1	37	407
J. Martin ..	Stanhope ..	38	402
F. J. Dinneen ..	Toora and Welshpool	23	397
H. R. Bjorksten..	Toora and Welshpool	29	391
Mrs. E. Cardwell	Eskdale and District No. 1	23	389
C. A. Bunn ..	Merrigum No. 2	24	382
A. Sim ..	Ondit Irrewarra	20	381
T. P. Sage ..	Leongatha and District No. 1	24	381
R. Allott ..	Toora and Welshpool	21	381
H. J. Hulme ..	Milawa No. 1	26	379
A. E. Charlton ..	Stony Creek No. 1	22	375
H. Horsburgh ..	Yinnar No. 1	35	375
J. D. Crother and Sons	Merrigum No. 1	25	372
J. S. Bullingham..	Tongala No. 1	39	372
A. M. Freestone ..	North Murchison	24	371
M. V. Dalton ..	Cohuna No. 2	30	370
L. Howes ..	Tongala No. 1	33	370
A. McLean ..	Gainsborough..	38	369
G. W. Shepherd ..	Bairnsdale No. 2	23	366
D. G. Christie ..	Echuca Village No. 1	28	364
Mrs. E. L. Heath and Sons	Camperdown No. 1	21	363
J. M. Lyle ..	Undera No. 1	32	363
Andrew Drage Jnr.	Upper Murray No. 2	22	363
J. B. French ..	Swan Hill ..	20	358
P. C. Watson ..	Warrnambool No. 1	32	355
J. G. Tudor ..	Stanhope ..	24	355
L. Purdon ..	Kerang No. 2	37	354
C. H. Sawyer ..	Cobden No. 2	29	354
C. Lee ..	Swanpool No. 1	25	354
S. Miles ..	Bass..	27	353
G. Hodgeson ..	Tongala No. 2	35	353
L. S. Kellet ..	Tongala No. 2	37	352
N. Muir ..	Warrnambool No. 2	36	351
H. Savage ..	Timboon No. 2	24	351
Sawyer Bros. ..	Swanpool No. 1	28	350
H. N. Barr ..	Cohuna No. 1	38	350
W. Buckland ..	Fish Creek ..	36	343

HERDS OF 40 TO 59 COWS.

Owner.	Association.	Cows.	Butterfat.
W. J. Brennan ..	Swanpool No. 1	40	428
W. Hornsby and Son	Cohuna No. 2	46	425
Harrison Bros. ..	Korumburra No. 4	40	401
Mrs. M. H. Park	Tallangatta No. 1	58	400
E. A. Swayn ..	Stanhope ..	43	396
Alex Walker ..	Yinnar No. 1 ..	55	394
F. Phillips ..	Cohuna No. 2	45	393
S. R. Fuller ..	Tongala No. 2	42	392
H. Holmes ..	Traralgon No. 3	49	392
J. G. Findlay ..	Upper Murray No. 2	40	391
N. G. Wallace ..	Warrnambool No. 1	44	385
A. J. Newton ..	Korumburra No. 1	41	380
D. and E. R. Mil-dren	Upper Murray No. 2	40	380
W. G. Baylin ..	Pyramid Calivil No. 1	41	377
Alex Lee ..	Cohuna No. 2	50	377
O. A. Riseau ..	Upper Murray No. 2	43	376
J. Nichol ..	Tallangatta No. 1	57	376
J. Barrow ..	Korumburra No. 3	40	376
A. L. and L. Will-mott	Kongwak No. 1	57	373
E. W. Croucher ..	Myrtleford-Whorouly No. 1	40	372
C. A. Schmidt ..	Foster No. 1 ..	45	366
N. J. and O. Thompson	Traralgon No. 3	47	366
V. Kulne ..	Leongatha No. 2	46	365
W. E. and W. H. Harris	Dumbalk North No. 1	49	363
J. G. Bamford ..	Ecklin South No. 1	49	363
W. Pleming ..	Tallangatta No. 1	42	362
A. and L. Waite ..	Traralgon No. 3	45	357
J. E. Wallace ..	Nirranda No. 2	56	357
E. Stephens ..	Korumburra No. 4	43	357
T. G. Farrant ..	Cohuna No. 1	48	356
L. R. Cooper ..	Kiewa Valley No. 3	52	355
Chas. Walker ..	Yinnar No. 1	44	355
E. Lee ..	Cohuna No. 2	41	345
J. Doyle (Snr.) ..	Cohuna No. 1	56	344
J. A. McKinnon and Sons	Port Campbell No. 1	50	344
J. H. Hamilton	Upper Murray No. 2	40	344
Vic Free ..	Leitchville and District No. 1	44	343
F. A. Gallagher ..	Swan Hill ..	42	341



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COROWA—C. R. Reade.

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DANDENONG—John F. Goulding. Tel. 147.

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HORSHAM and QUANTONG—Permewan, Wright Ltd., Tel. Horsham 17; Hardinge Bros. Pty. Ltd., Tel. Horsham 542; Quantong Fruit Growers Assn., Tel. Horsham 59.

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KYABRAM—Permewan, Wright Ltd. Tel. 98.

MILDURA—Dixon's Mildura Markets Pty. Ltd. Tel. 162.

MOOROPNA—O'Brien's Store.

MELBOURNE—Barker, Green, & Parke Pty. Ltd., 209 King Street; Permewan, Wright Ltd., 31 King Street.

PORTLAND, HEYWOOD—Norman Chapman, Private Bag 19, Portland.

REDCLIFFS—S. A. Donaghy, Indie Avenue. Tel. 424.

RED HILL—J. E. Holland Cool Stores.

RIVERINA AREA—Wagga.

STAWELL, POMONAL—T. A. Prydderch, Main Street, Stawell. Tel. 37.

SOMERVILLE—Poultrymen's and Farmers' Trading Co. Tel. 216.

STANLEY and BEECHWORTH—J. R. Sinclair & Sons.

SHEPPARTON—Permewan, Wright Ltd. Tel. 422; Sam Parkin, Tel. 89.

TEMORA—Riverina Cool Stores. Tel. 129.

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HERDS OF 60 TO 79 COWS.

HERDS OF 80 OR MORE COWS.

Owner.	Association.	Cows.	Butterfat.	Owner.	Association.	Cows.	Butterfat.
J. G. Howell ..	Leongatha No. 2	62	lb. 396	Mrs. A. Crosthwaite	Kiewa Valley No. 2	80	lb. 375
R. Farragher and Sons	Woodford No. 1	69	392	H. H. and L. Trease	Dumbalk North No. 1	82	339
L. Affleck ..	Traralgon No. 1	73	388	W. York ..	Dumbalk North No. 1	83	338
A. E. Barton ..	Kiewa Valley..	73	379	C. D. Crosthwaite	Kiewa Valley No. 2	97	315
W. H. Findlay ..	Upper Murray No. 2	69	375	E. M. Bourne ..	Korumburra No. 1	87	307
G. R. Jones ..	Warragul No. 1	75	346	A. J. Menzies ..	Leongatha No. 1	81	304
G. Dodd ..	Dumbalk No. 1	62	343	H. Batten and Sons	Warrnambool No. 2	85	302
F. B. Tonkin ..	Undera No. 1	66	341	H. and H. Harris	Upper Murray No. 1	96	296
R. J. Wells ..	North Murchison No. 1	66	337	A. Ashendon ..	Dumbalk No. 1	87	290
G. W. Purdey ..	Tongala No. 2	69	332	J. Counihan ..	Bairnsdale No. 1	87	285
C. Hill ..	Korumburra No. 1	67	332	O. and R. Pardew	Orbost No. 1..	112	280
Northey and Co.	Bethanga No. 1	60	330	A. and P. McKenna	Warrnambool No. 2	101	272
C. C. Nethercote..	Kerang No. 1	63	328	J. A. Ford ..	Kiewa Valley No. 2	119	268
J. C. Green ..	Kiewa Valley No. 2	66	315	M. P. Williams ..	Narracan Shire No. 1	84	268
Reid Bros. ..	Kiewa Valley No. 2	60	314	W. Counihan Es- tate	Bairnsdale No. 1	102	268
L. V. Brown ..	Tallangatta ..	63	313	J. W. Hanna ..	Upper Murray No. 2	86	267
Moyle Bros. ..	Tallangatta ..	71	312	G. W. Larkin (jnr.)	Kiewa Valley No. 3	98	263
G. Millard ..	Kongwak No. 1	77	309	J. H. Nixon ..	Orbost No. 1 ..	83	261
A. J. Brumby ..	Port Campbell No. 1	64	308	Thos. McNamara	Upper Murray No. 1	90	261
H. Walker ..	Myrtleford-Whorouly No. 2	72	306	R. Rogers ..	Paschendale No. 2	86	251
E. Larkin ..	Eskdale No. 1	76	306				
R. C. Barton ..	Kiewa Valley No. 3	76	305				
N. Paton ..	Upper Murray No. 1	63	301				
Truscott Bros. ..	Toora and Welshpool	66	293				
Mr. E. M. Piddington	Kiewa Valley No. 3	73	292				

BEST 20 TWO-YEAR-OLDS

Owner.	Association.	Cow.	Milk.	Butterfat.
			lb.	lb.
W. Matthews ..	Leongatha No. 1 ..	Bangor Stumpy 2nd	7,752	500
D. and E. R. Mildren..	Upper Murray No. 2	Agnes ..	8,576	493
C. Tucknott ..	Stanhope ..	Delma ..	9,025	478
J. A. Warnock ..	Swanpool No. 1 ..	Ruby ..	9,159	477
D. and R. Pardew ..	Orbost No. 1 ..	Ora ..	7,824	473
F. B. Tonkin ..	Undera No. 1 ..	No. 122 ..	7,959	466
L. J. Affleck ..	Traralgon No. 1 ..	Velvet ..	7,327	465
J. G. Howell ..	Leongatha No. 2 ..	Flossie ..	8,049	464
W. Fleming ..	Tallangatta No. 1 ..	Coronation Duchess	6,960	464
J. G. Bamford ..	Ecklin South No. 1	Heather ..	8,505	462
M. T. Williams ..	Swanpool No. 1 ..	Ruby ..	8,436	459
F. W. Fulford ..	Bairnsdale No. 2 ..	Pearl of Bell Point	8,685	457
S. R. Fuller ..	Tongala No. 2 ..	Iris ..	9,270	453
R. A. Seabrook ..	Korumburra ..	Brenda ..	8,415	453
T. Gaw ..	Bass ..	Tiger 6th ..	7,235	452
R. Coleman ..	Maffra-Sale No. 3..	Ellen ..	8,773	452
Mrs. G. Horsburgh ..	Yinnar No. 1 ..	Topsy 2nd ..	7,590	450
A. McLean ..	Gainsborough ..	Dora ..	7,044	448
T. A. Dickie ..	Katandra West No. 1	Topsy ..	7,980	441
H. W. Burgman ..	Katandra West No. 1	Comet ..	10,236	440

BEST 20 THREE-YEAR-OLDS

Owner.	Association.	Cow.	Milk.	Butterfat.
			lb.	lb.
T. A. Dickie	Katandra West No. 1	Topsy	11,839	623
Mrs. E. Cardwell	Eskdale No. 1 ..	Poddie	10,718	578
L. J. Affleck	Traralgon No. 1 ..	Betty	11,266	568
A. W. Hasthorpe	Naracan Shire No. 1	Fanny	9,212	552
W. Matthews	Leongatha No. 1 ..	Waverley Lass 6th	9,528	548
L. Gilbert	Nirranda No. 1 ..	Dainty	9,612	533
N. Kulne	Leongatha No. 2 ..	Denbigh Peach ..	9,504	532
L. J. Hanley	Bethanga No. 1 ..	Gloria	9,309	532
H. Walker	Myrtleford- Whorouly No. 2	Hope 4th	8,311	517
R. Coleman	Maffra-Sale No. 3 ..	Bamawm Fancy Gem	8,786	517
J. A. McKinnon and Sons	Port Campbell ..	Caroline	8,934	513
C. Tucknott	Stanhope	Myra	9,866	506
J. E. Wallace	Nirranda No. 2 ..	B. Bonny Ruby 3rd	8,412	504
J. H. Hamilton	Upper Murray No. 2	Peg	8,417	500
George La Fontaine	Eskdale No. 1 ..	Merle	8,281	500
J. S. Bullingham	Tongala No. 1 ..	Marie	15,142	499
Mrs. M. A. Park	Tallangatta	Kintore Lady Valda	8,041	487
G. Harrison	Dumbalk North No. 1	Helen	7,963	487
A. McLean	Gainsborough ..	Beryl	9,790	485
R. J. Cannon	Milawa No. 1 ..	Downside Dawn ..	9,903	484

BEST 20 FOUR-YEAR-OLDS

Owner.	Association.	Cow.	Milk.	Butterfat.
			lb.	lb.
M. Drane	Traralgon No. 2 ..	Glenloth Mavis ..	15,695	668
C. V. Ludeman	Nirranda No. 1 ..	May	7,860	660
A. E. Jeffries	Kongwak No. 1 ..	Jessie	9,589	629
J. A. McKinnon and Sons	Port Campbell ..	Elinure Priscilla ..	10,700	629
A. E. Saunders	Maffra-Sale No. 1 ..	Canary	8,973	629
W. Howard	Pomborneit No. 1 ..	Belle	11,283	596
G. and F. Brady	Traralgon No. 3 ..	Reddy	10,528	572
E. Cardwell	Eskdale No. 1 ..	Georgina	9,291	566
R. H. and J. L. Trease	Dumbalk North No. 1	Esther	7,760	560
H. W. Burgman	Katandra West ..	Fairy	10,012	558
J. G. Bamford	Ecklin South No. 1	Hazel II.	10,289	556
Mrs. A. C. Crosthwaite	Kiewa Valley No. 2	Dulcie	9,116	554
Hee McLean	Leongatha No. 1 ..	Denbigh Lola ..	9,422	550
D. and E. R. Mildren	Upper Murray No. 2	Amelia	10,259	549
J. M. Lyle	Undera No. 1 ..	Elsie	10,033	548
George Gray	Condah Swamp ..	M. Velvetten ..	10,947	548
C. C. Johnson	Myrtleford- Whorouly No. 1	The Camp Roseanne 11th	8,311	545
R. R. Farragher and Sons	Woodford No. 1 ..	Rosy	10,293	543
H. Savage	Timboon No. 2 ..	Toby	10,683	541
Mrs. J. S. O'Brien No. 2	Traralgon No. 1 ..	Kitty	8,176	541

SUMMARY OF ASSOCIATION HERD TEST DATA FOR YEAR ENDED 30TH JUNE, 1948

Area.	Units.	Herds.	Cows Tested.	Junior Cows Under 5 Years of Age.		Pure Bred Bulls.		Average Number of Cows in Herd.	Average Yield per Cow.		
				Juniors.	Per- centage.	Bulls.	Per- centage.		Milk.	Test.	Butter- fat.
									lb.	%	lb.
Goulburn Valley ..	20	498	16,782	10,257	61·1	517	103·8	33·7	5,806	4·55	264
North-Eastern ..	17	357	13,931	7,684	55·1	348	97·4	37·5	5,095	5·03	256
Gippsland ..	36	887	33,685	19,091	56·6	821	92·6	37·6	5,075	4·96	252
Western ..	25	585	21,878	11,823	54·0	510	87·2	37·6	5,068	4·7	238
Totals 1947-48	98	2,327	86,276	48,855	56·6	2,196	94·4	37·1	5,218	4·82	252

NOTE.—Details from—Bacchus Marsh; Beecac; Lang Lang; Maffra-Sale No. 2; Rochester Nos. 1 and 2; The Sisters; Winchelsea Nos. 1 and 2; Winslow Nos. 1 and 2—received too late to be included in this report.

HERD TEST DATA FOR PERIOD 1928-1947

1946-47 ..	93	2,160	79,303	18,264	23·0*	2,128	98·3	37·0	5,411	4·88	264·0
1945-46 ..	72	1,705	61,738	13,477	22·0*	1,623	95·0	36·0	5,043	4·73	239·0
1944-45 ..	59	1,415	53,015	22,396	42·0	1,320	93·0	38·0	4,654	4·68	218·0
1943-44 ..	31	782	27,346	14,988	54·0	805	103·0	35·0	4,740	4·70	223·0
1942-43 ..	25	623	22,154	(Details affected by war conditions)				35·0	4,959	4·70	237·0
1941-42 ..	40	946	34,218					36·0	4,960	4·74	235·0
1940-41 ..	70	1,645	60,108	25,988	42·6	1,390	85·0	36·0	5,200	4·70	245·0
1939-40 ..	101	2,346	84,690	34,723	41·2	2,004	85·0	36·0	5,450	4·79	261·0
1938-39 ..	100	2,275	79,805	34,248	42·9	1,904	83·6	35·0	4,749	4·70	221·0
1937-38 ..	104	2,401	86,048	37,467	43·5	1,969	83·0	36·0	4,876	4·70	227·0
1936-37 ..	107	2,350	80,528	36,106	45·0	1,874	81·0	34·3	5,076	4·80	244·0
1935-36 ..	108	2,416	80,817	37,817	47·0	1,946	81·0	33·0	4,934	4·70	233·0
1934-35 ..	113	2,446	79,701	36,116	45·3	1,991	81·4	32·6	5,309	4·59	244·0
1933-34 ..	134	2,910	92,953	43,394	46·0	2,214	76·0	31·7	4,723	4·51	212·0
1932-33 ..	141	3,383	104,009	46,392	44·6	2,619	77·0	31·0	5,290	4·55	241·1
1931-32 ..	130	3,098	89,619	36,946	41·3	2,323	75·6	29·0	5,393	4·58	247·3
1930-31 ..	132	3,085	90,360	32,867	36·4	2,251	73·0	29·0	5,383	4·30	234·0
1929-30 ..	116	2,604	76,032	24,439	32·1†	1,653	71·0	29·0	5,044	4·46	226·1
1928-29 ..	96	2,229	63,277	19,246	30·4†	1,354	64·0	30·0	5,080	4·38	223·3

* Denotes junior cows under 3 years of age.

† Denotes junior cows under 4 years of age.

LEADING MATURE COWS WHICH PRODUCED OVER 600 LB. BUTTERFAT

Owner.				Association.	Cow.	Milk.	Butterfat.
						lb.	lb.
J. G. Howell	..	..	..	Leongatha No. 2 ..	Jessie	11,925	754
G. and F. Brady	..	..	..	Traralgon No. 3 ..	Bluey	12,341	747
A. M. Freestone	..	..	..	North Murchison No. 1	Mabel	11,040	731
T. K. Kelly	..	..	..	Korrumburra No. 4	Beryl	10,678	703
E. Brady	..	..	..	Traralgon No. 3 ..	Jean	10,839	669
O. S. Martin	..	..	..	Traralgon No. 2 ..	Avon Sunflower ..	9,643	669
A. W. Hasthorpe	..	..	..	Narracan Shire No. 1	Verna	10,444	669
J. Crockett	..	..	..	Moyhu No. 1 ..	Blossom	7,589	665
R. T. Harrison	..	..	..	Dumbalk No. 1 ..	Champion	8,358	662
W. Renkin	..	..	..	Swanpool No. 1 ..	Rosemary	12,389	652
O. Jones	..	..	..	Dumbalk North No. 1	Nancy	10,428	649
M. Drane	..	..	..	Traralgon No. 2 ..	G. Cynthia	12,667	642

LEADING MATURE COWS WHICH PRODUCED OVER 600 LB. BUTTERFAT—continued.

Owner.	Association.	Cow.	Milk.	Butterfat.
			lb.	lb.
H. Walker	Myrtleford-Whorouly No. 2	Ruby 3rd ..	10,795	635
E. A. Swayn	Stanhope ..	Jewel	11,494	634
W. J. Brennan	Swanpool No. 1 ..	Peggy	11,360	630
F. B. Tonkin	Undera No. 1 ..	No. 90	16,026	630
G. R. Jones	Warragul No. 1 ..	Tulip	11,348	628
J. G. Findlay	Upper Murray No. 2	O. Madeira Duchess III.	10,237	626
C. A. Schmidt	Foster No. 1 ..	Twinkle	8,678	625
J. H. Hamilton	Upper Murray No. 2	Celia	10,056	622
E. Stephens	Korumburra No. 4	Lumeah Melody ..	11,566	621
W. R. Bjorksten	Toora-Welshpool ..	Champion	11,165	619
H. W. Burgman	Katandra West No. 1	Gem	11,922	618
Mrs. A. Crosthwaite ..	Kiewa Valley No. 2	Eva	11,234	617
G. G. and J. C. Cumming	Port Campbell No. 1	Belle	10,967	616
Alex Walker	Yinnar No. 1 ..	Polly	10,118	614
E. Stephens	Korumburra No. 4	Mervue Choice Soprano 9th	9,361	608
E. Stephens	Korumburra No. 4	Lumeah Pearl ..	9,504	605
W. R. Bjorksten	Toora-Welshpool ..	May Queen	9,234	605
W. J. Brennan	Swanpool No. 1 ..	Nell	10,113	605
J. G. Howell	Leongatha No. 2 ..	Rose	9,459	603
J. Moore and Co. No. 3	Yarram	Jersey	8,310	602
A. H. McDonald	Woodford No. 1 ..	Sport	10,633	600
R. Anderson	Warrnambool No. 2	June	11,699	600
F. Larrays	Warrnambool No. 2	Wilhemina	12,253	600

ASSOCIATIONS GROUPED ACCORDING TO AREA AND PRODUCTION

Association.	Number of Herds.	Number of Cows.	Number of Junior Cows Under Three Years.	Number of Pure Bulls.	Average Butterfat Per Cow.
					lb.
GIPPSLAND.					
Dumbalk North	21	965	297	23	297
Warragul No. 1	19	560	146	21	280
Dumbalk	23	866	204	10	278
Maffra-Sale No. 3 ..	19	810	242	18	277
Traralgon No. 3	30	1,242	323	30	275
Korumburra No. 4 ..	25	898	184	31	275
Maffra-Sale No. 1 ..	22	1,069	314	25	268
Korumburra No. 3 ..	25	989	237	34	267
Korumburra No. 1 ..	25	1,023	235	31	266
Bairnsdale No. 3 ..	26	862	226	23	266
Bairnsdale No. 2 ..	26	672	180	22	265
Yinnar	24	1,052	267	25	262
Leongatha No. 1 ..	23	967	213	28	262
Gainsborough	20	858	266	27	260
Narracan No. 1	26	970	169	18	256
Toora-Welshpool ..	26	906	227	2	256
Fish Creek	25	1,178	290	..	250
Stony Creek	26	983	243	..	250
Leongatha No. 2 ..	26	960	292	18	250
Bass	25	903	305	23	248
Yarram	24	1,243	322	28	247
Kongwak	25	1,015	259	24	246
Traralgon No. 1 ..	27	1,333	455	28	245
Warragul No. 2	23	755	185	33	245

ASSOCIATIONS GROUPED ACCORDING TO AREA AND PRODUCTION—*continued.*

Association.	Number of Herds.	Number of Cows.	Number of Junior Cows Under Three Years.	Number of Pure Bulls.	Average Butterfat Per Cow.
					lb.
GIPPSLAND— <i>continued.</i>					
Leongatha No. 3	23	587	152	23	242
Narracan No. 2	21	483	126	26	242
Pakenham	25	660	186	34	239
Boolarra	32	1,061	257	34	238
Narracan No. 3	25	771	194	25	237
Jindivick-Neerim	25	620	130	22	237
Traralgon No. 2	28	1,198	288	32	234
Foster	34	1,084	202	23	229
Bairnsdale No. 1	23	1,275	344	27	227
Buchan-Nowa Nowa	21	574	93	8	227
Orbost	23	1,481	341	26	217
Toora	26	812	159	21	214

WESTERN.

Warrnambool No. 1	20	849	211	30	275
Ecklin South	25	1,079	274	25	265
Port Campbell	26	1,080	192	27	261
Ondit-Irrewarra	26	835	182	19	258
Ballarat	26	771	244	44	248
Condah Swamp	19	571	83	14	248
Woodford No. 1	23	1,210	328	..	246
Warrnambool No. 2	19	934	233	23	246
Camperdown	17	371	66	14	244
Nirranda No. 1	24	935	267	10	242
Nirranda No. 2	25	934	232	9	242
Cobden No. 2	25	983	233	29	241
Port Fairy	25	977	210	12	241
Timboon No. 1	28	983	199	18	237
Portland	33	1,214	225	29	236
Paschendale No. 1	22	1,069	260	23	233
Paschendale No. 2	15	832	44	24	233
Pomborneit	25	906	213	32	231
Casterton	24	808	139	23	230
Timboon No. 2	25	659	89	6	223
Woodford No. 2	23	977	238	15	220
Macarthur	34	1,050	261	24	213
Noorat	25	841	101	28	202
Apollo Bay	26	818	180	28	194
Irrewillipe	5	192	48	5	283

GOULBURN VALLEY.

Cohuna No. 2	24	862	162	26	313
Stanhope	26	996	257	26	297
Tongala No. 1	24	878	217	27	293
Swan Hill	31	963	239	44	290
Merrigum No. 1	25	790	179	26	286
Cohuna No. 1	22	888	234	29	284
Katandra West	26	852	266	22	277
Tongala No. 2	21	892	218	26	275
Kerang No. 2	25	997	312	17	271
Merrigum No. 2	26	687	194	27	267
Leitchville No. 2	24	918	191	26	259
Kyabram	25	905	253	30	257
Undera	25	811	174	35	257
Kerang No. 1	23	847	213	23	254
Pyramid-Calivil No. 1	24	930	243	17	244
Leitchville No. 1	25	941	166	28	243
North Murchison No. 1	28	944	278	20	233
Echuca Village	26	542	128	26	218
North Murchison No. 2	26	704	178	25	209
Pyramid-Calivil No. 2	22	435	128	17	205

(continued on page 526.)

TUBERCLE-FREE HERDS

ACCREDITED TUBERCLE-FREE HERDS

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Aboriginal Station ..	Lake Tyers ..	86	Longerenong Agri. College	Dooen ..	39
Ampt, E. W. ..	Gymbowen ..	12	Luke, K. G. ..	Romsey ..	32
Ampt, N. C. ..	Gymbowen ..	21	Maloney, P. J. ..	Tongala ..	66
Ballarat Orphanage ..	Ballarat ..	139	Maybery, A. H. ..	Mitre ..	11
Banyule Stud Pty. Ltd.	Wangaratta ..	55	Middleton, J. A. ..	Labertouche ..	80
Beggs, A. R. ..	Beaufort ..	116	Moore, J., and Co. ..	Yarram ..	109
Black, I. S., Estate of ..	Mount Noorat ..	64	Murray, M. G. ..	Lima ..	19
Blackley Bros. ..	Horsham ..	18	McIntosh, J. ..	Merrigum ..	44
Bott, J. ..	Yarrowonga ..	70	McKenzie, A. E. ..	Kerang ..	54
Bruhn, C. H. and V. L. ..	Mirboo North ..	54	McKenzie, Mrs. E. J. ..	Woodford ..	81
Candler, G. E. ..	Hamilton ..	35	McKenzie, H. P. ..	Trawalla ..	15
Carne, W. J. ..	Pakenham Upper ..	30	McNabb, G. A., and Son	Irrewillipe East ..	196
Cason, J. M. ..	Lima South ..	63	Nancarrow Bros. ..	Kerang ..	56
Clark, W. J. ..	Monomeith ..	148	Newton, J. M., and Sons	Whorouly ..	63
Cowan, G. L. S. ..	Bacchus Marsh ..	59	Nicholas, M. A. ..	Sherbrooke ..	79
Cox, F. G. ..	"Birradale," Lyndhurst ..	47	Noonan, Mrs. S. A. ..	Benalla ..	68
Cribbes, T. ..	Wangaratta ..	40	Northcote Children's Farm	Bacchus Marsh ..	83
Deering, J. T. ..	South Wangaratta ..	79	Onley, W. H. ..	"Glenholme," Caldermeade ..	88
Dookie Agricultural College (Ayrshire Herd)	Dookie ..	117	Parker, Mrs. L. M. ..	Tallarook ..	67
Dookie Agricultural College (Hereford Herd)	Dookie ..	38	Payne, A. E. T. ..	"Yarra View," Lilydale ..	78
Eagle, W. H. ..	Womerah ..	31	Payne, T. E. N. ..	"Woodburn," Kilmore ..	72
Everist, F. R. ..	Tyabb ..	12	Poole, M. A., and D. ..	Caldermeade ..	161
Foletta, G. G., and Son	Buxton ..	121	Poole, M. A., and D. ..	Yannathan ..	118
Geelong Grammar School	Corio ..	81	Potter, W. J. ..	Longwarry North ..	118
Gilbert, J. A. and R. D. ..	"Brockelbank," Yinnar ..	108	Price, L. E. ..	Ellerslie ..	78
Gilmour, D. W., and N. B. ..	South "Yarravale," Hubert's-lane, Yering ..	121	Prosser, J. E. ..	Ondit ..	40
Gleeson, P. J., and Son	Tynong ..	261	Read, exors.; Estate I. D.	Springhurst ..	79
Gorman, A. W. ..	"Cathcart," Alexandra ..	57	Rix, A. A. ..	Officer ..	99
Griffiths, J. G. ..	Benalla ..	121	Roe, Thomas H. P. ..	Cobram ..	79
Gross, Mrs. G. F. ..	Horsham ..	30	Sanderson, R. F. ..	"Pleasant Hill," Kyneton ..	15
Hamilton, A. ..	Flinders ..	69	School of Horticulture ..	Burnley ..	75
Henry, J. A. ..	Merrivale ..	40	Scott, A. L. ..	"Wolonga," Kongwak ..	9
Howlett, Mrs. G., and Miss L. Samuel ..	Lang Lang ..	81	Scott, F. E. Selwyn ..	Scotsburn ..	43
Jackson, H. ..	Lockington ..	81	State Experiment Farm ..	Rutherglen ..	76
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Keele, H. A. ..	Bamawm ..	79	St. Joseph's Home ..	Sebastopol ..	34
Kelynaek, P. T. ..	Bundoora ..	90	Thomas and Taylor Pty. Ltd. ..	Hamilton ..	59
Kemp, E. J. ..	Horsham ..	16	Till, J. A. ..	Tongala ..	26
Kingsley-Newell, F. J. ..	Shoreham ..	60	Tucker, E. G. ..	Horsham ..	58
La Fontaine, G. ..	Mitta Mitta ..	61	Vagg, T. R. ..	Officedale ..	71
Lawrence, P. H. ..	"Rainga," Tarrawarra ..	82	Vagg, F. G. ..	Leongatha ..	56
Lawton, W. ..	Frankston ..	56	Variety Investments Pty. Ltd. ..	Woori Yallock ..	57
Light, D. T. ..	Noradjuha ..	12	Warnock, J. A. ..	Lima South ..	127
			Waterhouse and Son ..	Pakenham ..	77
			Williamson Bros. ..	Carlsbrook ..	67
			Wilson, J. L. ..	Koo-wee-rup North ..	119
					90

In addition to the above the following is a list of herds in their respective districts which have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but, inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the Accreditation Scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

District.	Herds.	Cattle.	District.	Herds.	Cattle.
Bairnsdale ..	4	109	Orbost ..	1	99
Ballarat ..	122	3,050	Portland ..	7	431
Benalla ..	43	298	Rutherglen ..	20	296
Bendigo ..	84	3,082	Sale ..	5	341
Broadmeadows ..	42	1,924	Terang ..	1	10
Colac ..	7	196	Traralgon ..	4	218
Doncaster ..	18	720	Wangaratta ..	38	475
Geelong ..	89	3,111	Warrnambool ..	7	423
Hamilton ..	2	94	Whittlesea ..	104	4,452
Heidelberg ..	19	593	Yallourn ..	4	269
Horsham ..	9	468	Yarragon ..	36	1,630
Morwell ..	3	270	Yea ..	30	82

There are also 375 herds in which 16,253 head of cattle have passed one test and may be considered, therefore, to be in process of becoming tubercle-free herds.

THE FLOWER GARDEN

By George Hyam,
Horticultural Supervisor

SUMMER ANNUALS

IT is not always realised that there are two groups of summer annual flowers; one comprising those which can be sown in August–September and planted out as seedlings during November for early summer flowering, and a second class, which normally flower in late summer and autumn, that should not be sown until November, when temperatures are higher.

The former include Crego asters, phlox, salpiglossis, African and French marigolds, bedding petunias, as well as successional sowings of species which will flower throughout the spring and summer. These latter include antirrhinum, calliopsis, gypsophylla, viscaria, and the seedlings of most flowering perennials, such as pentstemon, carnation, delphinium, and verbenas.

The less hardy group which should be sown now comprise American Beauty and giant Californian asters, zinnias, salvias, balsam, giant petunias, and foliage plants like celosia, amaranthus, and cockscomb. At the same time, a second sowing of the hardier summer annuals like phlox, salpiglossis, marigolds, or bedding petunias can also be made this month.

The seeds of most summer annuals can now be sown in outdoor seed beds or even direct in the flower beds. Phlox and salpiglossis are always best sown direct. In the hotter districts it is necessary to provide some shade for seed beds or boxes, and there is nothing better for this than a light frame covered with old fly-wire which gives the right degree of light.

Planting out seedlings should be done in dull weather or in the evening of a sunny day, first soaking the beds the day before and again watering each plant after planting.

For the first few days, a light sprinkling of water should be given daily; after that, a heavy soaking once or twice a week is better than more frequent sprinklings. This procedure will make the plants more resistant to hot-weather conditions. A

mulch on the beds will save loss in summer as this retains soil moisture and protects the roots from excessive heat. Mulching is particularly desirable on light sandy soils.

BACKGROUND PLANTS

The effect of a brilliant summer floral display is often spoilt in borders backed by a bare paling fence or wall. This can be avoided by planting certain climbing or tall-growing summer annuals if the fence is not already furnished with a climbing shrub.

One of the best of these is *Mina Lobata*, which quickly climbs on wire or trellis. It will grow to a height of about 6 feet and it has an abundance of attractive orange, red, and gold-tipped flowers that are suitable for cutting and these contrast nicely against its darker green foliage.

Mina Lobata seed is readily available and is sown in November direct, with two seeds to each site, 12 inches apart.

Other suitable climbing annuals are the ornamental gourds which can be obtained in packets of mixed varieties. These cucurbits first have masses of yellow flowers followed by large fruits in many curious shapes and colours. These fruits can be left on the vines to give an attractive effect for several weeks until the first frost, after which they can be picked for inside decoration. They are sown like pumpkin, three seeds to a hill with a spacing of 6 feet between the hills. With a little preliminary training on the trellis, they will cling without tying.

The Mexican sunflower, *Tithonia*, is a non-climbing annual which will grow to 6 to 8 feet in height and produces masses of rich orange flowers. In an open situation, *Tithonia* will form a useful breakwind for other summer annuals likely to be damaged by wind. Their seed is sown direct about 18 inches apart.

The tall varieties of celosia with their plume-like, multi-coloured flowers and

brilliant foliage make another good background plant. These will need a 3-ft. spacing and their seed is also sown direct.

SPRING FLOWERS FROM CUTTINGS

One of the best ways of improving the quality of winter or spring flowers is to propagate from cuttings taken from selected plants which have flowered the previous year. There are many which can be propagated in this way, and the best time to do this is in November.

Antirrhinums, pansies, violas, verbenas, pentstemons, petunias, lupins, ageratum, and geums are amongst those which are easily struck in this way, so, before removing any of these to make way for summer annuals, take cuttings of any which have shown outstanding merit. The advantage of this method over saving their seed is that the rooted cuttings will be perfect reproductions of the original plants in colour and form, whereas the progeny of the seed is likely to be variable.

In each case, short side shoots about 2 inches long, and which have not flowered, are pulled from the main stems with a small heel of the older wood attached. The

base is trimmed off neatly and all but the top leaves are stripped off. The cuttings are then struck in pots or boxes of washed sand by inserting at least two buds under the surface and ramming the sand around them.

A 5-in. pot will accommodate at least twelve to eighteen cuttings and, for the first fortnight, it is advisable to cover each pot with a wide-mouthed glass jar unless a glassed frame is available.

As soon as they are rooted as indicated by top-growth, the plants should be pricked out in boxes like seedlings or in separate pots to grow on. These should be kept under light shade and not allowed to get dry or be overwatered. If they tend to grow too rapidly, nip out the centres to make them bushy until the planting season comes round again in January–February.

The use of the hormone-rooting compounds on this type of cutting has shown some response, but the dosage has to be weak and it is still in the experimental stage. Probably, the powder form of rooting compound is the best to try out for these soft-wooded cuttings, as there is less likelihood of an overdose.

ASSOCIATION HERD TEST—(continued from page 523).

ASSOCIATIONS GROUPED ACCORDING TO AREA AND PRODUCTION—continued.

Association.	Number of Herds.	Number of Cows.	Number of Junior Cows Under Three Years.	Number of Pure Bulls.	Average Butterfat Per Cow.
NORTH-EASTERN.					lb.
Tallangatta	20	902	182	18	310
Swan Pool No. 1	25	810	225	29	301
Upper Murray No. 2	22	1,057	225	37	296
Upper Murray No. 1	19	889	185	14	271
Eskdale	23	1,025	269	39	264
Milawa	25	697	162	27	262
Kiewa Valley No. 1	23	895	193	7	253
Kiewa Valley No. 2	21	1,217	340	33	252
Moyhu	25	773	148	19	248
Swan Pool No. 2	24	628	193	17	244
Myrtleford-Whorouly No. 2	11	486	122	10	244
Bethanga	21	781	195	17	243
Myrtleford-Whorouly No. 1	19	842	239	26	238
Kiewa Valley No. 3	22	1,315	285	30	238
Euroa	14	73	19	10	236
Rutherglen-Chiltern	20	749	126	11	211
Yea	23	792	170	3	210

THE VEGETABLE GARDEN

By George Hyam, Horticultural Supervisor

CLIMBING BEANS

FOR the small garden, climbing beans can be recommended in preference to dwarf varieties as their yield per yard of row is considerably greater and the picking period from one sowing is much longer.

Picking is easier, and, where suitable stakes are readily obtainable and picking labour is scarce, climbing beans are worth consideration by commercial growers.

Considerable areas are grown in the U.S.A. for market and there have been a few areas so grown in this and other States.

There are two kinds of climbing beans; (a) annual varieties which are of the same species as the dwarf kinds such as the well-known *Epicure*; and (b) perennial beans, such as *Scarlet Runner*, *White Monarch*, and *White Czar*, which will crop for two or three seasons without re-sowing. The two latter are worth planting in quantity as their dried seeds are the white "butter" or Madagascar beans sold by grocers.

All climbing beans are deeper rooting than dwarf varieties, and only do well in a deep soil. Thus, trenching along the row, 18 inches wide and 2 feet deep, is advisable, with plenty of organic manure worked in throughout this depth. Climbing beans quickly suffer from drought conditions, and every effort should be made to make the soil retentive of moisture by incorporating humus matter in the soil and by

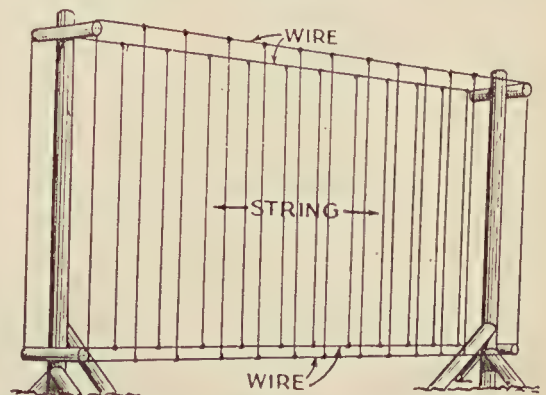
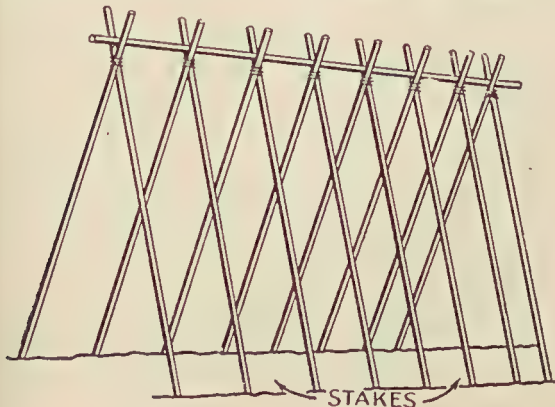
a surface mulch around the plants. Fertiliser is also applied as described for dwarf beans last month.

Annual climbing beans are sown in double rows spaced 12 inches apart and 6 inches between plants. Perennial varieties are spaced not less than 9 inches and, in both cases, the seeds in each row should be planted opposite to each other. To provide a support, light 8-ft. stakes of saplings, laths, or bamboo should be inserted 9 inches in the ground alongside each seed. These are then pulled over so that they cross each other about 12 inches from the top, and then tied in position to form a V-shaped trough. Stakes are laid horizontally along this to give rigidity.

An alternative method is shown in the accompanying illustration. Each stake or string will then carry one bean plant. When the first shoots are about 6 inches long, tie them to the support, after which they will climb without further tying.

Climbing beans need plenty of water in summer and this is best applied by planting in a shallow depression and flooding it.

When the beans are in flower, and particularly on hot days, the plants should be sprinkled overhead at least once a day, otherwise they may fail to set. All beans should be picked before the seed starts to swell or further cropping will be checked.



Two methods of supporting climbing beans. When the shoots are about six inches long tie them to the supports. No further tying will be necessary.

Occasional side dressings of 5 : 1 superphosphate and ammonia or liquid manure will prolong the yield.

SWEET CORN

The first of successional three-weekly sowings of sweet corn can be made in early November. As the cobs are only at their best for culinary use for a few days, it is not advisable to plant too many at one time. Corn is ready for use in about 80 days from sowing and plantings can continue until mid-January.

Unless wanted as a breakwind for other crops, it is best to plant in groups rather than single rows for pollination purposes. Sow the seeds $1\frac{1}{2}$ inches deep, three seeds to each site, with a spacing of 12 inches between plants after thinning. If planted in rows, the row-spacing is the same, but the rows should be at least 3 feet apart.

Sweet corn does best when following legume or green-leaf crops. Before sowing, open up a drill about 4 inches deep and 6 inches wide and apply 3 : 1 superphosphate and ammonia along this at the rate of 1 oz. per yard. Fill in; firm down; and sow on top. It is possible to interplant sweet corn with climbing beans so that they can use the corn stalks as a support. Both plants will carry normal crops if the row has been trenched and manured as recommended for climbing beans. Golden Bantam and Country Gentlemen are the best of the varieties at present available, but, when they are on the market, the new hybrid varieties are better.

CUCURBITS IN THE HOME GARDEN

Unless the garden is a large one, home gardeners should plant only those varieties of vine vegetables which are compact in habit or which can be pruned to a more or less bush form, otherwise they will restrict the area available for other summer crops.

In such gardens, the Table Queen, Hubbard, or White Scalloped squash should be preferred to pumpkins, and only the bush-type of marrows should be planted.

Melons and cucumbers are easily kept in bounds without loss of yield by pruning methods which will be described in next month's issue. Most pumpkin varieties need an area equivalent to 4 or 5 square yards per plant. In the south, rock and water

melons should be sown not later than the end of November and usually, the Honey Dew or Casaba melons are the best kinds to plant in these areas, as they will produce until the frosts come. All cucurbits should be planted in full sun; in the shade they are apt to develop mildew.

OTHER NOVEMBER WORK

In the high cool districts, November is the best month to plant potatoes; Up-to-date or late Carman (No. 3) being the favored varieties in such districts, though Katahdin and Sebago are increasingly grown.

In warm districts, the early-planted tomatoes will be starting to flower, and this is the time to apply side dressings of 4 : 1 : 1 superphosphate ammonia and potash at the rate of about a teaspoonful per plant.

All tomato plants should be regularly dusted with one of the special tomato dusts, applying every three weeks until February. In southern areas, November is the start of the main plantings of tomatoes, and the late varieties can still be sown in all districts.

Sowings of egg-plant and capsicums can now be made, and, in the home garden, these are best sown direct in the beds. Sow three seeds to each site, finally spacing egg-plants 24 inches apart and capsicums 18 inches with a 3-ft. row spacing in each case. Both do best when sheltered by taller-growing plants, such as staked tomatoes, sweet corn, or climbing beans.

The seed of Succession cabbage and Brussels sprouts should be sown in November for planting out in beds previously occupied by early beans or main-crop peas. The seed bed should always be made on ground that has not recently grown a brassica crop. In small gardens, these seeds can be sown in a flat-bushel fruit case which has been opened on the side. Sow in drills 4 inches apart for easy weeding and without manure except for a very light dusting of superphosphate. Cover the seed with a light mulch of completely rotted manure. Dust young plants regularly, for, if their centres are attacked, they will fail to heart properly.

In southern districts, prepare the soil for the main sowing of carrots and parsnips early next month. Both require plenty of humus in the soil during the summer months, but any manure applied should be well rotted.

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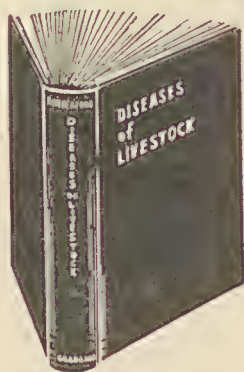
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THE POTATO CROP

Seed, Planting and Cultivation

By G. H. Mattingley, Potato Expert



Inter-row cultivation of potato crop with a scuffer, Koo-wee-rup district.

SEED POTATOES

IT has long been recognized that the use of high-grade seed stock is of prime importance in the production of potatoes. Since the introduction by the Department of Agriculture of the Seed Potato Certification Scheme in 1938, the causes of potato degeneration and disease have become better understood, and there has been a growing appreciation on the part of potato growers of the value of good seed and its effect on yield. As evidence of this, it is pointed out that the average yield during the five-year period 1941 to 1945 was 3.64 tons per acre, an increase of half a ton per acre over the five-year period preceding the introduction of the Certification Scheme.

Dipping

The dipping of seed potatoes in a fungicidal solution as a means of controlling the spread of tuber-borne scab diseases is

recommended. Dipping is particularly advisable when planting in new land, or land having a record of producing fairly clean crops, but its value is questionable when the land is known to be heavily infested with the disease-producing organisms of Common Scab, *Rhizoctonia*, &c. Virus diseases and other troubles carried over within the tuber are not controlled by dipping, as the fungicide cannot penetrate the tuber.

Storage of Seed Potatoes

The method adopted for carrying over seed potatoes from harvest to the following planting is important as the success of the crop depends largely on the treatment accorded the seed during this period. The majority of growers store their seed requirements in pits or in heaps in an open shed, but it is essential that seed potatoes be stored in such a way as will preserve



Seed potatoes stored under excellent conditions.

them in sound condition. This can be effected in several ways, for example—

- (a) by storing them at shallow depths on racks or shelves in the open under trees;
- (b) by placing them on racks in a well-ventilated barn;
- (c) by storing them in specially-constructed seed-potato boxes.

Irrespective of the method of storage used, it is advisable to stimulate bud growth from more than one eye by covering the tubers until such time as the shoots are just showing. Then, when exposed to full ventilation and light, the tender white shoots will be hardened off and rendered fit to withstand the handling incidental to planting without sustaining much damage. Furthermore, this treatment facilitates seed cutting, by eliminating the danger of using sets with blind or weak eyes.

Seed Cutting

The cutting of potatoes to be used for seed, which is the normal practice in Victoria, is essentially a question of economy. Where large tubers are available for planting, it becomes necessary to subdivide these in order that they may provide a greater number of sets and so keep down the cost of seeding per acre.

In the first stages of growth, the shoots produced are entirely dependent on the nourishment they derive from the parent

seed-piece. It is obvious then that large sets can give a better start to the crop, and are better able to withstand adverse soil conditions than small sets.

In cutting large tubers, care should be taken to see that at least one good eye is left in each section; that portions showing weak shoots are discarded; and, finally, that the seed-pieces are blocky and uniform in size, ensuring an even feed through the planter. In normal

practice, sets are cut from $1\frac{1}{2}$ to 2 oz. in weight.

As a general rule seed potatoes are cut just prior to planting. However, if it is desired to hold cut seed for a short time before planting or if planting is to be done in hot dry or cold wet soils, the cut surfaces of the seed tubers should be healed over or suberized. This healing occurs naturally in sound tubers kept at moderate temperature and at a relatively high humidity, when a protective corky layer develops over the cut surface. Under favorable conditions this healing process normally occurs in the soil after planting.

Suberization may be accomplished by cutting the seed potatoes into clean wet bags—not manure bags, as the chemicals may cause some burning. Place the bags in a warm, well-ventilated position, splashing water over them as they tend to dry. The healing takes place most rapidly at a temperature of 60° to 65° F. and may be completed in about 48 hours when the sets will be ready for planting.

FERTILIZERS

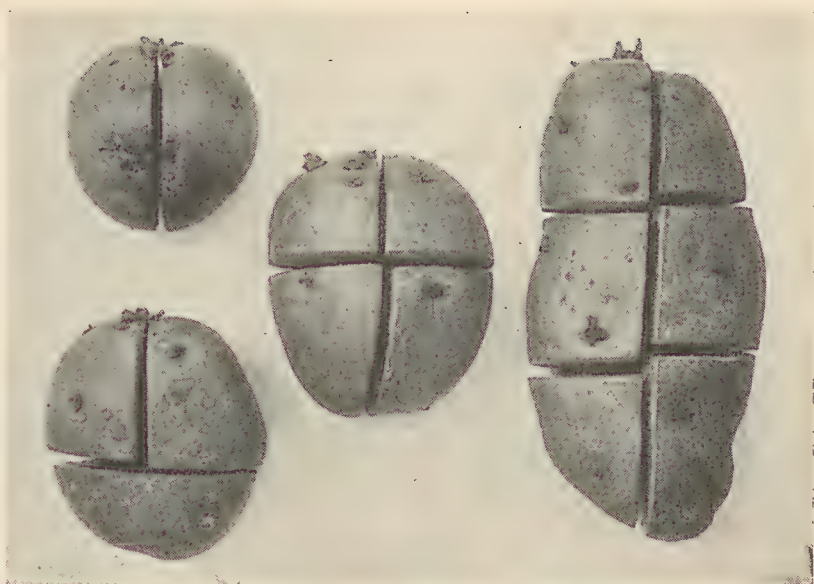
With few exceptions, the potato soils in Victoria require the addition of fertilizers to produce potatoes on an economical scale. As a class, Victorian soils are markedly deficient in phosphorus, all fertilizer mixtures being based upon this essential. Nitrogen is next in importance as a fertilizing element, while potash seems to be of least consequence.

There are certain forms of these fertilizers more suitable than others for application to the potato crop because of their effect on quality and production. The best way to apply phosphorus is as superphosphate, which normally contains 22 per cent. phosphoric acid, most of which is water-soluble. This fertilizer has a beneficial influence on the table quality of the potato and a big influence on yield. When used alone it has the effect of hastening maturity by approximately two weeks. Unlike nitrogenous fertilizers, the phosphates are not lost by leaching.

Nitrogen should be used for potatoes only in the form of sulphate of ammonia, which contains about 20 per cent. nitrogen, or as dried blood (12 per cent. nitrogen). Nitrate of soda is unsatisfactory, as its high solubility permits leaching from the soil by heavy rains, and its potential effect upon the crop is lost.



Correct placement of fertilizer in relation to the seed-piece is indicated in this illustration.



Method of cutting potatoes for seed. The tuber top left, weighed 3 oz. ; lower left, 5 oz. The centre tuber weighed 7 oz. and the one on the right 10 oz.

With several exceptions, it would seem that there is sufficient potash available in Victorian soils to suit the needs of the potato crop. However, if it is desired to add potash to the manurial dressing, the sulphate form should be used, as if applied as chloride or muriate of potash, the table quality of the tuber is lowered, even by small dressings.

Rate of Application

Most farmers use the compound fertilizers which are now put up by all the leading manufacturers, thus avoiding mixing on the farm, and ensuring better keeping and running qualities. As a result of field experiments with fertilizers on potatoes, the requirements of the various potato-growing soils can be stated fairly definitely. On the volcanic soils of the Central Highlands and the Western District, 4 cwt. per acre of superphosphate and ammonia in the proportion of 3 : 1 is recommended, while, for the clay loams of South Gippsland, the volcanic loams of the Gippsland hills, the swamp soils at Koo-wee-rup, in fact for most other soil types, superphosphate and ammonia 6 : 1 is used at rates varying from 6 to 12 cwt. per acre according to location.

Where potash is to be included in the fertilizer dressing, complete fertilizers may be employed. These usually consist of a base of 5 parts of superphosphate, with 1 or 2 parts sulphate of ammonia and 1 part sulphate of potash.

Placement of Fertilizers

In addition to using the fertilizer dressing applicable to local conditions, it is most important that the fertilizer shall be placed where the plant will have access to it. By the end of the second month of growth the root system of the potato plant is fully developed, and the plant has taken up approximately four-fifths of its total food requirements. Fertilizers, therefore, should be so placed that they are available in the early stages of crop growth.

In Victoria, fertilizers are applied to potatoes either by sowing broadcast before planting or by sowing in the furrow with the seed, by hand or machine. Virtually no sideways movement of fertilizer salts occurs in the soil, therefore, anything outside the scope of the root system is of no use to the plant. By placing the fertilizer in the furrow with the seed, the supply of all available nutrients per plant is greatly increased as compared with broadcast application.

Experience has shown that greater benefit can be obtained from the fertilizer dressing by applying it in bands 2 inches away on each side of the seed pieces. Some mechanical planters are equipped for sowing in this fashion. A factor in favour of this method is that by concentrating the fertilizer in a small compass, the rate of fixation of the soluble phosphoric acid is reduced, and it remains readily available to the plant for a longer period.

Lime

Lime should be used with caution on potato soils, firstly because the potato does best in an acid soil, and secondly because of the danger of decreasing soil acidity to a point where the growth of the fungus causing Common Scab is encouraged. However, over-cropping and the continued use of sulphate of ammonia accelerate the rate at which lime is removed, leading to a state of excess acidity where fertilizers rapidly become unavailable to the plant. This condition may be corrected by judicious application of lime to the sown pastures in the cropping rotation.

SOIL PREPARATION

Because of seasonal variations in climatic conditions and the wide differences between the classes of soils in which potatoes are grown, it is impossible to lay down any rules that can be followed in preparing land for potatoes. The object, of course, is to obtain, by the intelligent use of available implements, the correct condition of soil tilth that the crop demands. Proper soil condition is necessary for the full development of the crop and the consistent production of economic yields.

Whether the land should be broken up in autumn or in the spring depends largely upon the preceding crop and the nature of the soil. Heavy land benefits from



Fallowing land for a potato crop.

being left in fallow over the winter months, whereas light soils in danger of being washed away by winter rains should be ploughed in spring.

Wherever the depth of soil will permit, the first ploughing should be to a depth of 7 to 9 inches, but on land where the top soil is shallow the depth of ploughing is governed by the depth of surface soil. In some districts a second ploughing is given and this should be about 2 inches shallower than the initial working.

In addition to the plough, the disc or spring-tooth cultivators, the harrows and to a lesser extent the roller, all play an important part in the production of a good seed-bed.

Generally speaking, the initial ploughing should be followed by the heavy harrows and the disc cultivator. If a second ploughing is given it should be followed by the disc cultivator and the land allowed to lie in that condition until planting time. It is inadvisable to work the soil down too finely, as in the event of heavy rains falling, the surface is liable to run together and become so closely set as to necessitate much of the preparatory work being done again.

PLANTING

The planting of the potato crop in Victoria extends over a considerable portion of the year. Commencing as early as June in districts favoured with a mild climate, a succession of plantings continues without a break from June to December, and, in the case of very late districts, even into January. The major portion of the acreage, however, is planted during the period extending from the middle of October to the end of November.

The actual planting for the most part is done by mechanical means, though a fair proportion of the Victorian crop is seeded by hand, by a man walking behind the plough. The self-contained planter



A mechanical potato planter in operation.

that makes a furrow, places the fertilizer, drops the seed, and covers in the furrow again is used in many districts, and a planting mechanism which fits on to the three-furrow plough is also commonly employed. In many cases the seed is planted by a man riding on the plough and dropping the sets down a chute delivering between the second and third furrows.

The harrows are generally run over the fallow prior to sowing so as to produce an even surface. It is inadvisable to harrow more than a day or so ahead of the planter, however, as, in the event of rain setting in, the finely-worked soil is liable to become caked on the surface. With hand planting, the seed pieces or sets should be placed on the ploughed land side of the furrow, as, in this location, they are in loose soil and also out of the way of the horses' feet when the covering round is being done.

Depth of Planting

For average local conditions prevailing in Victoria, the best depth of planting is from 4 to 5 inches. With the self-contained type of planter, the ridging done by the covering discs is apt to be deceiving, and there is always the danger of planting the sets shallowly. If any difficulty is experienced in getting down to the required depth, a good plan is to precede the planter with a rotary hoe or a spring-tooth cultivator set to full depth.



Regular cultivation suppresses weed growth.

Rate of Planting

For general practice, the spacing recommended is 27 inches between the rows and about 15 to 18 inches between sets in the rows. Close spacing in the row reduces the number of hollow and oversize tubers, and should be adopted when planting those varieties which are prone to this trouble. Early varieties are generally placed 15 inches apart in the row, the spacing of the later sorts being increased up to 18 inches or more. In the Central Highlands the Snowflake variety is often planted 24 inches, and more, apart in the rows.

The quantity of seed to use per acre varies with the spacing and the size of the seed-pieces. The general practice in Victoria is to use sets from $1\frac{1}{2}$ to 2oz. in weight, although in the market-garden areas, and in the Western District, the tendency is to cut seed about half this weight. With normal spacing and average-sized seed-pieces, from 10 to 12 cwt. of seed per acre will be required.

MANAGEMENT OF THE GROWING CROP

Cultivation

There are several reasons why the soil should be cultivated after planting and during the growing period of the crop.

First of these is the fact that well-cultivated soil is capable of absorbing and retaining moisture to a greater degree than soil which is compact or hard. Secondly, the physical condition of the soil is maintained at a satisfactory standard, permitting a sufficiency of aeration to take place, thereby promoting the action of the living organisms in the soil that assist in breaking down otherwise unavailable plant foods. Further, improvement of the mechanical condition of the soil permits freer root spread in search of soil nutrients.

Good mechanical condition, too, has a big influence on the shape of the tubers, for, in well-cultivated soil, the tuber is free to expand without restriction, and develop to full size with more perfect shape.

Harrowing is the cheapest form of cultivation utilized in agricultural practice. By its employment, a large area of ground can be cultivated to a shallow depth in the course of a day at a small cost per acre. After planting, and until the crop is well up in the rows—even to a height of 4 or 5 inches—effective work in preserving good surface tilth can be done by harrowing at frequent intervals. Harrowing at this stage is an excellent means of killing off weeds as they germinate, and will eliminate the necessity for much hand weeding later.

Once the plants reach the height of 4 to 5 inches, subsequent cultivation must be confined to the horse hoe or scuffler, an implement designed for cultivating between the rows of growing crops. The scuffler is procurable in one- and two-row models, the latter being most suitable for large areas. Owing to the wide variation of soil textures and seasonal conditions, it is not possible to set down any rule as to the number of scufflings that should be given to the crop, but generally there should be not less than two during the season. The

intervals of time between cultivations will vary with the season and rate of growth of the crop. The first scuffling of the season should be done fairly deeply with the implement set as wide as possible without damaging the plants on either side. Each subsequent cultivation should be at a narrower width and a shallower depth in order to allow for the increased growth of the plants. If the season permits an approximation to these suggested times of cultivation, the crop normally should be coming into full bloom by the time the third cultivation is given.

Moulding

As a general rule, moulding plates are attached to the scuffler when the third cultivation is being given. These form a mould or hill of soil around the plants. This is desirable for two reasons, the first that it saves tubers formed near the surface from being greened by exposure, and, secondly, the tubers are protected from attack and damage by the grub of the potato moth. Good hilling combined

with good tilling is a safeguard against loss in the field from this source. It is preferable that the mould be wide and flat on top rather than high, narrow, and pointed, as in the latter case little protective covering remains for tubers forming at the sides.

Moulding is of value where machine diggers are employed as the lifting share can be projected with greater ease to the required depth, and tubers are less likely to suffer damage.

Hand Weeding

During the season, opportunity should be taken to go through the crop several times to remove weeds growing in the rows. At the same time, weak, diseased plants should be destroyed and "strangers" or "rogues" discarded. Unhealthy plants are unproductive and are potential carriers of disease to a succeeding crop. The growth of pure parcels of any variety is desirable as, where varieties are mixed, yields may be lessened owing to the differences in the period of maturation.

Australian Journal of Scientific Research

A New Publication

The Council for Scientific and Industrial Research, in collaboration with the Australian National Research Council, has established in Australia a new scientific journal, the "Australian Journal of Scientific Research," as a medium for the publication of research papers of outstanding merit. This journal is open to receive contributions from research workers, irrespective of country or of the organization to which they are attached.

Dr. N. S. Noble has been appointed editor of the new journal. Editorial policy is determined by an editorial board under the chairmanship of the editor and comprising as members:—Professor W. J. Dakin, Department of Zoology, University of Sydney; Professor E. J. Hartung, Department of Chemistry, University of Melbourne; Professor L. H. Martin, Department of Physics, University of Melbourne; and Professor J. G. Wood, Department of Botany, University of Adelaide. In order to maintain the Journal at a high standard a strict refereeing system has been instituted.

The Journal is printed in two series:—Series A, (Physical Sciences); and Series B, (Biological Sciences). Each series is issued quarterly, the subscription being 30s. per annum. The first two numbers of each series have been issued, and enquiries and orders for the new journal should be addressed to the Secretary, Council for Scientific and Industrial Research, 314 Albert-street, East Melbourne.

LIVE STOCK NOTES

Compiled by A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

EMINENT DAIRY SCIENTIST TO VISIT VICTORIA

Professor W. E. Petersen

Dr. W. E. Petersen, Professor of Dairy Husbandry, University of Minnesota, United States of America, whose film "The Science of Milk Production" has introduced him to many Victorian dairy farmers, will visit Victoria from the 18th to 23rd December, 1948.



Professor Petersen.

Dr. Petersen's visit is being made at the invitation of the Australian Dairy Produce Board. During his brief stay in Victoria, arrangements have been made for him to address public meetings at the following centres:—

Camperdown

At 8.00 p.m., Monday, 20th December, in the picture theatre.

Warragul

At 8.00 p.m., Tuesday, 21st December, in the picture theatre.

Melbourne

At 8.00 p.m., Wednesday, 22nd December, at the Melbourne University, Carlton.

The Australian Dairy Produce Board has asked the Victorian Dairy Farmers Association to organize the meetings at Camperdown and Warragul. All persons interested are invited to attend.

Dr. Petersen's brilliant work is recognized throughout the world. He is an outstanding lecturer and Dr. J. L. Lush, Professor of Animal Breeding at the University of Iowa, United States of America, who recently visited Victoria stated that, when he was in England recently, people were still talking about the wonderful public addresses Dr. Petersen had given there twelve months previously.

PIG CARCASS COMPETITIONS

Pig carcass competitions in Australia during the past eleven years, have done much to improve the quality of pigs raised in this country.

The competitions are conducted under the "Smithfield" method of pig carcass judging (commonly referred to as the Hammond System). Among other things, they have demonstrated that many pig raisers waste food and time in making their pigs too fat to suit pig buyers and the people who eat pig meat.

Competitions have been organized by agricultural societies, breed societies and Departments of Agriculture. Recently these bodies have been joined by the Australian Meat Board, which this year provided substantial sums of money for prizes and for organizing bacon pig-carcass competitions in all States of Australia.

In Victoria a pig competition committee, representing the Australian Meat Board, the Department of Agriculture, the Pig

Society, the Royal Agricultural Society and pig-meat traders, was formed to conduct the Meat Board's first bacon-pig competition in May, 1948.

That competition, which was reported in the June, 1948, issue of this Journal, brought forward 60 entries which made one of the most instructive displays of live pigs and carcasses ever seen in Australia.

The most satisfactory feature of that competition was the expressed intention of many visitors and competitors to enter their pigs in the next competition to be held in the autumn of 1949.

A feature of the Meat Board competitions is that they are not restricted to breeders of stud pigs as in the pork and bacon pig carcass competitions at the Melbourne Royal Show. Any pig breeder in Victoria may enter his animals.

Particulars of the 1949 Meat Board Bacon Pig Competition can be obtained, together with entry forms, from the State Representative, Australian Meat Board, 401 Collins-street, Melbourne.

All pig breeders who desire to see their pig carcasses appraised and displayed, and who wish to compete for the several prizes are invited to enter. Total value of the prizes is approximately £100. Full particulars may be obtained from the Board, and intending competitors are advised to obtain this information as early as possible to enable entries to receive full preparation.

The standard used for judging the pig carcasses requires an abundance of lean meat with a comparatively light covering of fat. The carcasses should be relatively long in the body, have thick hams and light shoulders.

Pigs which score high marks in the judging are generally the result of skilled breeding and feeding. Pigs bred from long-bodied, thick-hammed parents are more likely to develop into good baconers than those bred from short-type stock. However, breeding alone does not determine the carcass quality of a pig; feeding has at least as much influence as breeding.

The full development of a pig's muscles (lean meat) depends largely on its receiving from birth through its growing period, a diet ample in quantity and containing sufficient protein-rich foods (such as separated

milk or meatmeal), lime and salt as a mineral supplement, and green food in addition to cereal grains or meals.

Pigs adequately fed and free from worms and disease, grow rapidly to a stage when they are in proper condition for slaughter. That is, they are fleshy and finished, but not excessively fat.

Big-type pigs and those fed a limited diet reach prime killing condition at heavier weights than small-type pigs and those given a very liberal diet. Each pig should be killed when in prime condition, irrespective of its weight if prime, lean carcasses are to be obtained.

If a pig reaches prime condition at a relatively light weight and it is desired to make it heavier before killing, this can be done by restricting its daily food allowance to a little less than it could eat. If this is done, the pig will grow more slowly to a heavier weight, becoming relatively longer and leaner. The restricted feeding in the later stages of a pig's growth enables its muscles to continue growing, but restricts the development of fat.

The Meat Board Bacon Pig Competition provides for pigs from which dressed, chilled carcasses, including heads, weigh between 120 lb. and 180 lb.

[L. A. DOWNEY, H.D.A.]

TRANSPORT OF LIVE POULTRY

Poultry farmers should refrain from despatching live poultry to market during excessively hot weather. The birds are very susceptible to heat apoplexy, and apart from the financial loss one should also consider the humane aspect. Even during cool weather birds become distressed when closely crated for extended periods.

The present system of the transport of live poultry to market is inadequate, as the number of deaths in transit is still as high as it was many years ago. The transport of sheep, cattle, and pigs does not present the same problem as poultry, because of the better system of trucking used for these classes of stock.

The birds need a continuous circulation of air passing through the crates to prevent the air becoming saturated with moisture

and their temperature reaching dangerous levels. If consignments could be picked up in sufficient numbers along the route to justify the use of open trucks similar to sheep trucks, the number of deaths in transit of poultry despatched to market would be considerably reduced.

In the process of respiration, heat from the body is eliminated largely through the lungs and partly by radiation from the skin surface. When the body surface rises in temperature, as in hot weather, respiration increases, and the bird may open its beak to facilitate the rapid exchange of a sufficient

Ascertains how long it will take the birds to reach their destination.

Do not be influenced by high prices to rush birds to market, if there is the slightest risk of losing them on the journey. Average prices are better than no returns at all.

[M. D. HALL, Poultry Expert.]

THROWING CATTLE

Cattle can be thrown fairly easily by two men with a rope. The rope needs to be fastened to the animal's horns or top of the halter which is tied at the throat.

The rope is then put round the body of the animal in two half hitches for a small beast, as shown in the accompanying photographs, or in three half hitches for a large one.

The animal is then led forward and as it moves the man at the rear pulls on the end of the rope and the animal falls down. When down it is advisable to hold the



amount of air to carry away the excess heat. Moisture is evaporated from the lungs during breathing, and the more moisture that can be evaporated, the greater the cooling effects. When there is poor circulation, the air becomes saturated with moisture and cannot take up more by evaporation.

The following points should be observed :—

Despatch birds only when weather conditions appear suitable.

Provide sufficient space for the birds to travel in comfort.

Place drinking water in all crates, and arrange for water to be replaced en route.

Never leave crated poultry in the hot sun, either on the farm or at a railway station.

Crate and consign the birds as near as possible to the starting time of the train or transport.



Throwing a young bull (see text).

animal's head so that it does not get its feet under itself and get up again before it is finished with.

The half hitches are made on the side, as shown, as they will move upwards towards the backbone when the end of the rope is pulled.

[A.C.T.H.]

BRACKEN-FERN POISONING IN CATTLE

The common bracken fern is a poisonous plant, a fact which surprises many

stock-owners who have not encountered losses in country where the plant is prolific. Mortalities in cattle do occur, however, and the following suggestions are made to account for trouble experienced in bracken country.

The poisonous principle of the bracken plant is not known. As a consequence, there is no certain knowledge at what stage of growth the plant is toxic or what parts of the plant are likely to cause trouble. Some poisonous plant species are dangerous to stock at certain times of their growth, while harmless at others. Most important, too, is whether the cattle eat the bracken or avoid it.

Ferns are normally unattractive as forage, but it is also true that cattle will sometimes eat material which usually they ignore. Calves are sometimes observed feeding quite greedily upon the younger and softer fronds, but most probably the calves are not being properly fed and looked after when this occurs. Significantly enough, calves are poisoned more frequently than adult stock. Cattle may eat bracken during drought, or when land is overstocked. Although it has not been definitely observed, the fern might also be sought by animals when the pasture is particularly succulent, and no chaff or hay is being fed.

Feeding experiments in England have indicated that a great quantity of bracken is necessary to cause death. It is also known that this poison is cumulative—meaning that an animal does not develop any tolerance to it as a result of continued intake, even though a long period might elapse before symptoms commence.

Australian experience suggests that cattle are the only animals affected by bracken-fern poisoning, but in Canada losses in horses have been experienced.

The symptoms of bracken-fern poisoning are variable, and in some cases little is observed among the animals but loss of appetite, disinclination to move, depression, followed by death after some days.

Where a number of cattle is affected, certain rather striking symptoms are likely. These include blood-stained nasal discharge and blood-stained droppings and urine. When these symptoms occur, the disease is most unlikely to be any other than bracken

poisoning. On post-mortem, huge haemorrhages are found under the peritoneal surface of many of the organs—that is, on the outside of the stomach, intestines, heart, &c., and also on the inner surface of the abdominal or chest wall. Ulcers are often found in the intestines, and blood-stained urine in the bladder.

There is no treatment that can be recommended for affected cases, and once obvious symptoms commence, the animal is not likely to recover. By way of prevention, however, it is advisable to keep calves away from ferns altogether, and to so regulate the feeding of other cattle that they will be unlikely to use bracken as a supplement.

[D. M. McQUEEN, B.V.Sc.,
Veterinary Officer.]

BEEKEEPING

This is the flowering period for Red Gum, one of the main sources of the summer honey-flowers. The flowering period lasts from seven to eight weeks, and humid weather is the best for major secretion of nectar.

Excessively hot weather, accompanied by wind is detrimental to an extended flow. The blossoms become scorched, and wither off within a few days. Red Gum in the Western District is a fairly reliable yielder, but in other parts of the State it may be erratic.

With the present high price of hive material, transport, and the limited supply of petrol, it is good beekeeping practice to operate very strong colonies of bees.

Three hundred well managed, prime colonies, headed by prolific queens, will often give a bigger yield than twice this number under less efficient conditions.

Observations over a period of years show that the three to four hundred colony unit is the most economical. Many larger outfits become unwieldy, involving excessive overhead expense in management and movement.

In moving from one flow to another, apiarists usually hand-pick the most prolific colonies and give them priority of movement. The poorest colonies are moved last.

When very large apiaries are operated, the prolific colonies that had priority of movement may fill in a few days, and

remain idle until extracted out, after the entire apiary has been moved. This happened during the 1946-47 season in districts west of Horsham, when the flow was at its best. Losses amounted to over forty pounds of honey per colony.

During a flow, unproductive colonies are known to the beekeeping fraternity as "passengers", and are to be avoided if the best returns for labour and investment are desired.

Some apiarists unite the weak and medium colonies until they have a thirty-two comb

standard frame unit headed by a vigorous queen. Others sort out the weak colonies, and move them to a special building-up, and queen-replacement location, to be dealt with at an opportune time, and using them at a later date for honey gathering.

As autumn budding is scarce, many apiarists will have to rely upon Red Gum stores for winter. Wise apiarists will have this in mind when finishing up on the Red Gum flow.

[W. A. COLLINS, Apiary Inspector.]

Inexpensive Aids to Clean Milk Production

Conditions in the milking shed can frequently be improved by the adoption of simple home-made devices. For example, washable and cheap overalls can be made from a jute bag or similar material. Unpick the seams and make an apron with a centre opening after the style of a divided skirt. Attach a band at the top to fasten round the waist and hem the sides and centre opening to prevent fraying. Sew on tapes so that the overall can be fastened at the thigh, knee, and ankle.

An effective squeegee for cleaning concrete floors can be made from a section of an old motor tyre about 10 inches long. Cut off the wire beading and nail the rubber to an old yard broom. This will prove very effective in removing water and liquid from a concrete floor.

A rat trap is a simple and effective appliance for holding a cow's tail during milking operations. The trap is fastened

to a dividing rail or leg-rope post with screws. The spring is lifted and the tail switch clipped in position. This method of holding the cow's tail while she is being milked does away with the risk of a broken tail, as sometimes happens when the switch is fastened to a rail and the cow released from the bail with the tail still attached to the post.

The following will prove a suitable substitute for running water in the milking shed :—

Erect a wooden stand near the shed wall, clean out a petrol drum or an old 50-quart milk-can and fit with a tap. This can be refilled with water as required. The container can be painted to prevent rust. A clean sardine tin makes a good holder for soap and a clean towel completes the required equipment.

[Contributed by the Dairying Division.]

Christmas Mails

PUBLIC'S CO-OPERATION SOUGHT BY POST OFFICE

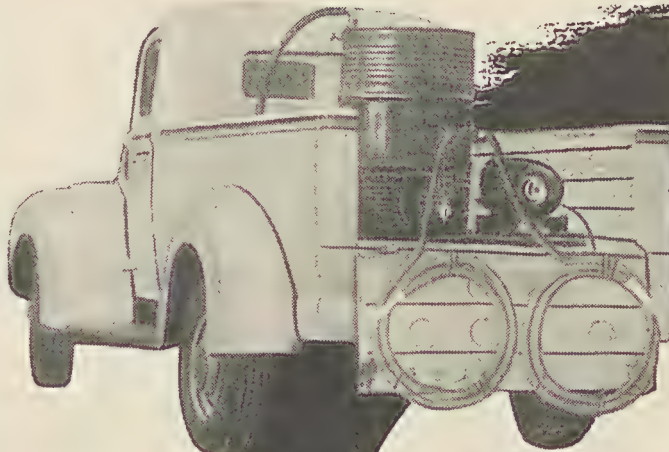
The Deputy Director, Posts and Telegraphs, appeals to readers to post their Christmas mail as early as possible, and not later than Friday, 17th December. There is every indication this year that the exchange of Christmas gifts and greetings will exceed previous records.

The following suggestions are offered :—

- (1) Make sure that each address is clear and complete.
- (2) Pack all gifts securely, and show the name and address of the sender, preceded by the word "from". If *tie-on labels* are used, the address should also appear on the wrapping.
- (3) Christmas cards may be posted at 1½d. rate of postage if the envelope is left unsealed, and not more than five words of greeting are written on the card.

FIRE

CONTROL

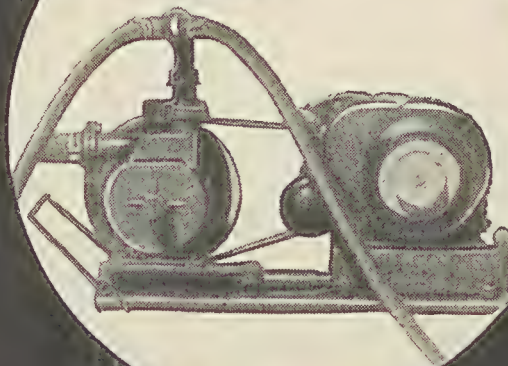


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OVERSEAS EXPORT OF APPLES

SUGGESTED IMPROVEMENTS

By G. B. Tindale, B.Agr.Sc., Cool Storage Research Officer

When apples are exported, the main concern has been that they shall arrive overseas in a perfectly sound condition, that is, free from internal disorders and of excellent appearance, showing good colour and freedom from skin blemishes.

In view of the increasing competition which we must now meet from English gas-stored apples, it is suggested that, in addition to the above, we must be able to present to the buyer, apples of excellent eating quality.

The following article explains why this is so difficult to achieve under our present methods of handling export apples. If the practice of pre-cooling were adopted, however, combined with picking the apples at correct maturity, it should be possible to place on the English and other overseas markets, apples of such excellent eating quality and appearance, that we should be in a position to hold our own against all competition.

FOR many years exporters of apples from Australia were in a favoured position in so far as export of their product to England was concerned. As the seasons in the two hemispheres are opposite, our apples arrived in England during the spring and early summer, when the local stored apples, or apples imported from Canada or the United States were at least six months old and possessed little, if any, flavour. The trade always sought out new season's apples from Australia in preference to the long stored local article.

Of late years however we have more or less lost this "natural" advantage. New methods of storage have been evolved and today large quantities of apples are kept in England in gas storage. Apples can be kept in gas storage for periods up to six months and on removal, as well as being of excellent appearance, possess quite fair to good flavour. (In ordinary cool storage apples are usually quite devoid of flavour after six months' storage.)

In quality these local gas-stored apples are not so much below the new season's apples arriving from Australia and consequently Australian apple exporters are up against a new source of competition. Further competition may be expected and viewed from that angle our future prospects may not be very bright.

It is of interest to remark that one discovery, namely refrigeration, permitted Australia to land her apples overseas out-of-season, thus giving her a natural advantage on the English market. A second discovery, gas storage, has more or less eliminated this natural advantage. The question arises, are we to "bow to the inevitable", and stand idly by watching our market shrink? Can't we, in some way so improve our apples that the trade would again seek our new season's product in preference to the local article?

Fortunately we now possess the knowledge and, in Victoria at least, the facilities whereby this could be accomplished with relative ease.

Before discussing in detail how this might be accomplished, it is desirable to discuss the role played by refrigeration in relation to the "keeping" of apples. Apples, unlike other perishable products such as butter, meat, or eggs, are actually living products even after they have been picked from the tree. The rate of living depends largely on temperature and by lowering the temperature, that is by refrigeration, the living processes are slowed down so that the apple "keeps" longer. Nevertheless, even in cool storage, the apple is slowly but surely running its life course and ultimately it becomes soft or mealy and loses its flavour. An apple which has been stored to the limit of its storage life may still be attractive in appearance, yet may not "eat" well. Indeed many people buying attractive-looking, but overstored apples and finding that they are devoid of flavour, speak disparagingly of them as "those cool-stored apples".

But it is not cool storage that is at fault, for apples cool-stored for say two or three months are scarcely distinguishable from freshly-picked apples. The fault is the abuse of cool-storage, that is, the storing of apples beyond the limits of their cool-storage life.

In gas storage, which is a modified form of cool storage, the life processes are slowed down still further than is possible in ordinary

cool storage, so that flavour and condition can be retained longer. Nevertheless apples gas-stored for six months are not nearly as good in flavour and condition as freshly-picked apples.

Bearing further on this important aspect of flavour in apples, it is necessary to stress the fact that, to obtain from storage apples possessed of excellent flavour, it is necessary to pick each variety at a particular stage of maturity, and then place the apples promptly in cool storage.

If apples are picked too soon, they are hard, woody, sour, and possessed of little if any flavour. When such apples are cool-stored, they are apt to shrivel, while certain varieties are apt to develop the disorder, Bitter Pit.

If, on the other hand, apples are picked too late, they will be tending to softness and possessed of little flavour, and when placed in cool storage will quickly become mealy and lose what little flavour they did possess.

There is an intermediate stage of maturity termed the "optimum picking maturity" when the apple is crisp, juicy, sweet, and possessed of full flavour typical to the variety. In cool storage, apples so picked retain all these desirable qualities to the maximum extent.

The time that apples retain these desirable qualities in cool storage, namely the cool-storage life, depends also on variety. Varieties which mature quickly have only a short storage life. Taking extremes the Gravenstein maturing in February has a cool-storage life of about three months, while the Granny Smith maturing in April has a storage life of about seven months. An "intermediate" variety such as Jonathan maturing in March, has a storage life of about five months. As the result of trials extending over several years the optimum picking periods for our main varieties have been determined. For varieties maturing in February the optimum picking period is limited to about ten days; for varieties maturing in March it is limited to about a fortnight; while for varieties maturing after March it is limited to approximately three weeks.

In any one district the optimum picking dates for the different varieties are fairly constant from year to year, but may be a week earlier in an "earlier" year, or a week later in a "late" year. Likewise in early

districts the optimum picking dates for the various varieties may be a week in advance of that for average districts, and a week later in late districts.

In Victoria numerous cool stores are now to be found throughout nearly all the apple-producing districts, and a large percentage of the apple crop is cool-stored for periods which may be long or short. Growers who store their apples are generally aware of the above-mentioned factors, and aim at picking their varieties at the optimum picking maturity and then promptly cool-storing them. No experienced grower would think of picking his apples and leaving them in sheds for a few weeks before placing them in cool store because, exposed to warm temperatures in the shed, the life processes of the apples would proceed at such a fast rate that their remaining storage life would be greatly shortened.

Taken by and large, due to close observance of correct picking maturity, prompt storage, and correct storage temperatures, the outturn of apples from Victorian cool stores is good. It is not until towards the end of the year when overstored apples are marketed; that there are many complaints by the consumer.

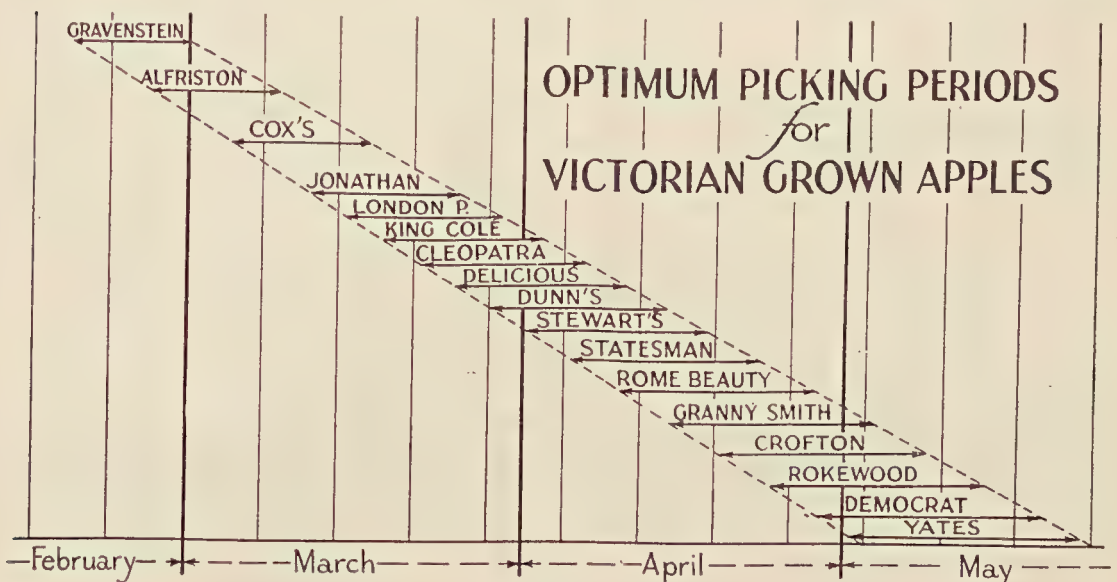
Compare now the practice and results of local storage as outlined above with the practice adopted for export. The export period, that is, the period on board ship under refrigeration, is only a little over a month. It would seem, therefore, that, for

such a short storage period little trouble would be experienced. On the contrary, however, troubles are infinitely greater and more numerous in the case of export, than in the case of land storage. Observers overseas readily admit that the eating quality of our apples on English markets is not as good as that of apples removed from Victorian cool stores.

When a grower picks apples for local storage his main concern is to pick them at the optimum stage of maturity. When picked, they are carted, unpacked, to the cool store and stored without further handling; packing for market is done months later after storage.

For export however, a grower has to wrap and pack and consign as soon as possible after picking. Most growers produce only a limited number of varieties of which the Jonathan is the most widely grown in Victoria. This variety should not be picked, in an average district, before the middle or after the end of March, otherwise eating quality after cool storage or export will be sadly lacking.

Growers however with a large acreage of Jonathans find it impossible to pick, wrap, pack, and consign for export all their Jonathans over such a short period as two weeks. Nor are ships available to lift the Jonathan crop over such a short period. Growers are obliged to spread their activities over a much longer period, probably a month



at least, so that they commence with apples which are immature, and finish with apples overmature. Both the immature and overmature apples will be devoid of Jonathan flavour by the time they reach English markets and consequently have practically no advantage from the selling point of view over the English gas-stored apples picked six months previously.

The next great weakness in our methods of handling apples for export is the treatment they receive between picking and finally cooling in the ship's hold. As mentioned previously, for land storage the apples are usually cooled within a day or two of picking.

For export however, considerable time is necessary to wrap, pack, and consign apples. Moreover, while picking and packing is necessarily proceeding all the time during the bustle of the export season, the movements of the ships are irregular, and between sailings, the wrapped and packed fruit "banks up" in the orchardist's shed for anything from a week to two weeks or even longer. This practice more than any other causes a rapid deterioration in the eating quality of the fruit, and is one which must be avoided if we hope to place apples of good eating quality on the English market.

In orchardists' sheds temperatures are fairly high, anything from 70° to 90° according to the weather conditions, and by reason of the fruit being wrapped, tightly packed, and the cases stacked, the apples at those high temperatures suffer rapid deterioration in eating quality.

The next most serious fault in our present methods is the fact that the refrigerated hold on board ship is necessarily filled quickly, in perhaps two days, with "hot" apples, that is, apples which have not been cooled.

On land stores, chambers are filled slowly and any land store engineer would readily appreciate what a tremendous task it would be if his chambers were filled quickly, say within two days, with fruit at a temperature of say 80° and he were then asked to reduce the temperature to 34°.

Under circumstances which prevail during export overseas it often takes weeks to reduce the temperature of all the fruit to 34°, by which time of course half the voyage is over, and much of the "life" of the fruit wasted.

With our present system all the above-named faults are inevitable, not with every shipment of course, but certainly with a large proportion. How then can they be overcome?

The solution is simple, and may be obtained by the adoption of the practice of pre-cooling. By pre-cooling is meant the practice of placing the apples in cool storage as soon as possible after picking, and packing and shipping them *after* they have been cooled to the carrying temperature, usually 34°. By adopting this practice it would be easy for the grower to pick each variety over the narrow optimum picking period, for no longer would he have the feverish rush to grade, pack, and forward each consignment of apples as soon as it is picked.

By placing the apples in cool storage when picked, deterioration in the apple is then almost completely arrested, enabling the grower to pack his fruit at any time to suit himself. After packing, the apples would be returned to the cool chamber to await shipment. It would not matter then if shipment were delayed for weeks; no harm would be done to the apples. On the other hand, under present conditions, some unforeseen delay to shipping can practically ruin the eating quality of a whole consignment.

When it comes to the actual shipment overseas, it is a simple matter to carry under refrigeration a hold full of fruit which has already been cooled, no matter how quickly the hold is filled.

Incidentally, there is the matter of "slack packs" in export apples. When apples are packed while hot, and then stacked in hot sheds awaiting shipment, there is considerable loss of water from the fruit. Such apples perceptibly shrink, resulting in slack packs by the time they arrive overseas. The trade frequently condemns our slack packs, and assumes that the apples have been packed slack, whereas, in most cases, it is the handling methods which are responsible rather than faulty packing.

If pre-cooling were adopted, there would be practically no shrinkage after cooling and "slack packing" would be eliminated.

As an instance of what could be done if pre-cooling were adopted, there is the matter of shipping early varieties in February.

The trade has always been on the lookout for an early-maturing variety which is also a good keeper. Actually these

factors are opposed, for the quicker an apple matures, the quicker it passes its life in storage. In other words it is a poor keeper, and has a short storage life compared with a variety maturing in say April. In the Gravenstein variety we have a most delicious variety which matures in February. On account of its relatively short storage life, about three months under present methods of handling, export of this variety is doomed to failure. In February, atmospheric temperatures are high and in the period between picking and placing on board ship, the Gravenstein would rapidly pass from a crisp and juicy state with excellent flavour to a soft, mealy, and flavourless condition. If however, the Gravenstein is picked over the narrow optimum picking period of about 10 days only, then promptly cooled, packed while cool, and returned to the cool chamber awaiting shipment and finally carried on board ship at a temperature of about 32°-34°, it should arrive at its overseas destination in a state of prime eating quality.

It is of interest here to recall that in the early years of pear export, outturn was often bad. Pears mostly have a storage life shorter than that of apples and it was realized that the only method by which a



A consignment of Victorian apples going aboard for shipment to Great Britain.

sound overseas trade could be developed was by prompt pre-cooling after picking. This, so far as Victoria was concerned, was made compulsory, and from then onward the export trade in pears from Victoria was highly successful. Now Victoria easily leads the other States in the pear export trade.

It was considered by many that because apples have a somewhat longer storage life than pears, pre-cooling was not necessary for export apples, but as explained above it behoves us now, in the face of increasing competition from gas-stored apples, to put on the English market apples superior in eating quality to the English six-months-old gas-stored apples, and it is put forward that this can be accomplished by means of pre-cooling.

Standard Herd Records

The Standard Herd Records for pure-bred dairy cows for the quarter ended 30th September, 1948, will be available for distribution early in the New Year. Copies may be obtained on application to the Superintendent of Dairying, Department of Agriculture, Melbourne, C.2.

CHICK SEXING

RESULTS OF EXAMINATION

By Martin D. Hall, Poultry Expert

AN examination in chick sexing was conducted by the Department of Agriculture in October last, covering a period of five days.

Special and First-class Certificates have been awarded to candidates from the commencement of the chick sexing examinations in 1938, and Second-class Certificates were awarded for the first time in 1944.

Candidates for a Special Certificate are required to sex 300 chickens in 45 minutes, with an accuracy of 98 per cent., without killing or injuring a chicken. Those sitting for a First-class Certificate are required to sex 200 chickens in 30 minutes, with an accuracy of 95 per cent.; and for a Second-class Certificate, 200 chickens in 50 minutes, with an accuracy of 95 per cent., without killing or injuring a chicken.

During the course of an examination, candidates for the Special Certificate who are unsuccessful in qualifying for this certificate can qualify for either a First or a Second-class Certificate for the first 200 chickens sexed, provided that the conditions governing the respective classes are complied with. Similarly, candidates for a First-class Certificate can qualify for a Second-class Certificate and also those sitting for a Second-class Certificate can qualify for a First-class Certificate.

RESULTS

Twenty-four candidates presented themselves for examination—3 for a Special Certificate, 20 for a First-class Certificate, and 1 for a Second-class Certificate. Of the total number of 24 candidates, Mrs. D. Jeremiah qualified for a First-class Certificate, having obtained an accuracy of 96 per cent. Miss E. Jackson with an accuracy of 95.5 per cent. and Mr. N. Hargreaves with 95 per cent. both qualified for a Second-class Certificate, and their names have been added to the list of qualified sexers.

The sexing at this year's examination was of a high standard, four other candidates having obtained an accuracy of 94 per cent.

LEARNING TO SEX

Chick sexing is difficult to learn and, to become proficient, it is necessary to receive expert tuition and to have considerable practice and experience with thousands of chickens. Reliable authorities have stated that a student must sex at least 250,000 cockerels before the male genital eminence can be accurately recognized. The expert sexer appears to be endowed with a natural ability to recognize and classify the various types of genital eminences to be found in chickens, but accuracy is only obtained by regular practice, investigation of errors and a liking for the job.

Most students learn to recognize the typical genital eminences of both sexes, but it is the unusual types that are difficult to sex. These represent approximately 10 per cent. of all chickens, and can only be classified under the guidance of an expert tutor.

It is not advisable for students to undertake commercial chick sexing before they have completed their studies, as they may keep repeating their errors, and never attain a satisfactory degree of accuracy.

COMPLETE LIST OF QUALIFIED CHICK SEXERS

A list of holders of chick sexing certificates, issued by the Department of Agriculture since the commencement of the examinations in 1938, is shown hereunder:—

Special Certificate

- Mr. K. C. McLister, 176 Hall-street, Spotswood, W.14. (Awarded 1939. Accuracy 99.0 per cent.)
Mr. H. A. Jenkin, 18 Corio-street, Belmont, Geelong. (Awarded 1939. Accuracy 98.7 per cent.)

First Class Certificate

- Mr. E. J. Marchant, 56 White-street, Mordialloc. (Awarded 1938. Accuracy 98.0 per cent.)
Mr. T. H. Pettigrove, Fulton-road, Box Hill. (Awarded 1938. Accuracy 97.5 per cent.)
Mr. W. J. Millington, 1 Lyne-grove, West Brunswick, N.12. (Awarded 1938. Accuracy 96.5 per cent.)
Mr. C. Bode, Research P.O. (Awarded 1939. Accuracy 96.0 per cent.)
Mr. D. Martin, 9 Glenliss-avenue, Werribee. (Awarded 1946. Accuracy 96.0 per cent.)

First Class Certificate—continued.

Mrs. D. Jeremiah, "Cranhaven," Box 21, Frankston. (Awarded 1948. Accuracy 96.0 per cent.)
Mr. A. T. Hewett, Central-avenue, Bayswater. (Awarded 1945. Accuracy 95.0 per cent.)
Mr. L. J. Smith, Cotterell-street, Werribee. (Awarded 1945. Accuracy 95.0 per cent.)
Mr. A. Bradshaw, Valley-road, Highton, via Geelong. (Awarded 1946. Accuracy 95.0 per cent.)
Miss E. Bruce, Glenormiston South, via Terang. (Awarded 1947. Accuracy 95.0 per cent.)

Second Class Certificate

Miss E. Jackson, 4 Monash-street, Box Hill. (Awarded 1948. Accuracy 95.5 per cent.)
Mr. E. Bourband, 3 Watkins-grove, Mordialloc. (Awarded 1946. Accuracy 95.0 per cent.)
Mr. M. Akam, 3 Davis-street, Brunswick, N.10. (Awarded 1947. Accuracy 95.0 per cent.)
Mr. E. G. Williams, 91 Tone-road, Wangaratta. (Awarded 1947. Accuracy 95.0 per cent.)
Mr. N. Hargreaves, 12 Bruce-street, Moonee Ponds. (Awarded 1948. Accuracy 95.0 per cent.)

Burnley Egg-Laying Competition

Progress Totals—235 Days

The number of first-grade eggs laid to 21st November, 1948, by the leading fowls in each class of the Burnley Egg-laying Competition, together with the names of the birds' owners, are set out in the following tables. The tests, which are being conducted at the School of Primary Agriculture and Horticulture, Swan-street, Burnley, commenced on 1st April, 1948, and will conclude on 2nd March, 1949, a period of 336 days. First-grade eggs, during the first two months of the competition, must weigh not less than $1\frac{3}{4}$ oz. and not less than 2 oz. thereafter.

Pen No.	Competitor.	Total First Grade Eggs.
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Class 1.—White Leghorns—Wet Mash.

147	Hill, H. E.	214
146	Goddard and Harvey	211
142	Gibb's Highway Stud	207
128	Abikhair, Les	202
160	Lowe, G. R.	199
139	Bonview Poultry Farm	189
154	Sunridge Poultry Farm	189

Class 2.—White Leghorns—Dry Mash.

235	Skinner, A. A.	200
229	Moran, G.	198
205	Clements, W. H.	194
230	Moran, G.	190
216	French, R. E.	184

Class 3.—Light Breeds, other than White Leghorns—Wet Mash.

105	Doull, J. (Legbars)	161
126	Woollett, C. J. (Legbars)	161
104	Chalmers, H. L. (Legbars)	160
119	"Glenyuille"	157
120	"Glenyuille"	154
115	Kemp, H. L. (Legbars)	153

Pen No.	Competitor.	Total First Grade Eggs.
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Class 4.—Australorps—Wet Mash.

35	Paton, W. S.	210
31	Hanson, S. H.	198
4	Beswick, A. G.	196
7	Casper, A. and L.	194
11	Cumming, H. D.	188
19	Head, E. A.	188

Class 5.—Rhode Island Reds—Wet Mash.

76	Fraser, D. R.	180
98	Wear, J.	175
89	Mills, J. J.	169
80	Grenville Stud Poultry Farm	166
71	Cropley, H. J.	161
63	Seven Acres Poultry Farm	159
90	Mills, J. J.	159
96	Wakeham, W. M.	159

Class 5.—All Heavy Breeds, other than Rhode Island Reds and Australorps—Wet Mash.

54	Cocking, W. (Light Sussex)	136
58	Lang, J. (Langshan)	124
56	Wilkinson Bros. (Light Sussex)	120
57	Lang, J. (Langshan)	112

Pasture and Sheep Investigations at the Mallee Research Station

The following account of experimental work conducted at the Mallee Research Station was prepared by Messrs H. J. Sims, M.Agr.Sc., Cerealist; and J. M. McCann, B.Agr.Sc., Manager of the Station. This article, together with other material published in the September and October issues of the Journal, has been included in a guide book which is available for general distribution and for the information of visitors to the Station.

PASTURE INVESTIGATIONS

One object of the pasture investigations at the Station is to demonstrate whether a better type of pasture can be grown in the Mallee than that which develops naturally and on land left out of cultivation. The herbage growing on land in its first year after cropping normally consists of self-sown cereals, mustard, barley grass, Arabian grass and brome grass. Wild turnip appears on the sandier areas. When the land is left uncropped for a longer period, the perennial plants develop to a greater extent, and plants such as spear and wallaby grasses, saltbushes and allied species, and New Holland daisy become established, while "Ham and Egg" daisy predominates on the light sandhills. In addition to increasing the stock-carrying capacity, an improved pasture would provide better protection for the soil against erosion by wind.

Large increases in carrying capacity are required to justify much expenditure on seed and manure for sown pastures in the Mallee. To be economically successful, a sown pasture in the Mallee must be cheaply established and produce superior or more feed than natural pasture over a number of years.

The cheapest forms of artificial pasture are probably sown cereals, or Wimmera rye-grass sown with the previous crop. Promising legumes are lucerne and barrel medick.

It appears, from the investigations already conducted, that, despite the labour involved in sowing, sown pastures in the Mallee cannot seriously challenge the use of cereal crops for winter and spring grazing, and for the supply of adequate early greenfeed for stock.

The value of sown pastures as compared with natural species lies in the greater bulk of feed produced over a longer period of the year, particularly in the case of perennial types such as lucerne, which respond quickly to summer or autumn rain.

The encouragement of clovers or medicks is also of importance in maintaining soil fertility. Certain natural species, such as spear grass and barley grass, seed early and have objectionable seeds which may affect the wool and skins of sheep and lambs.

A feature introduced in 1934 was the establishment of a pasture plant nursery. In this, seeds of drought-resistant species obtained from various parts of the world were tested. Observations were made on their growth and persistence and those species which it was considered might be suitable for Mallee conditions were tested out in large plots under field conditions. Among those which have been tried out in the field are lucerne, crested wheat grass, perennial veldt grass, Wimmera rye-grass, blue lupins, early strains of subterranean clover (Dwalganup, Mulwala, and Bacchus Marsh), barrel medick, confinis clover, snail clover, evening primrose, rice-millet grass, bulbous blue grass, Toowoomba canary grass, Palestine strain of strawberry clover, berry saltbush, and sheep's burnet.

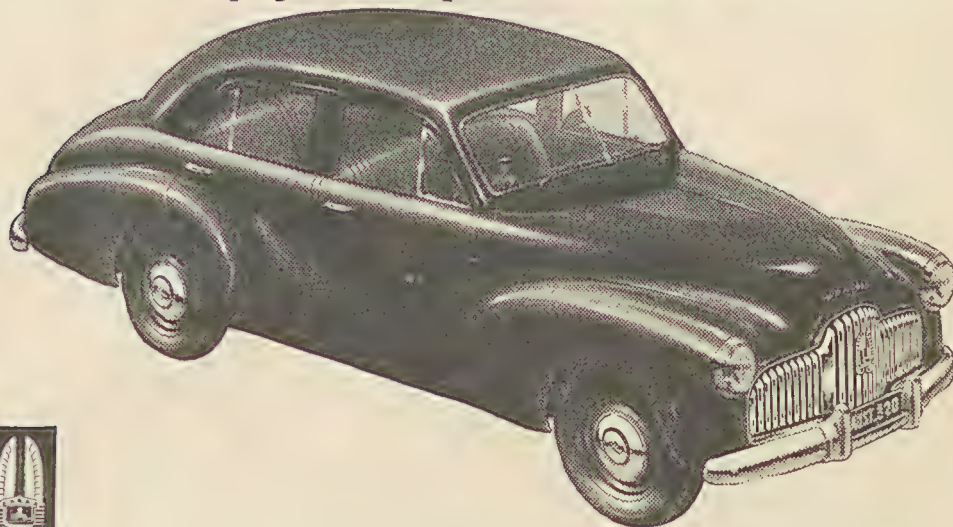
In the field trials, the usual method of establishing the pasture has been to sow the pasture seed through a grass seeder attachment at the same time as the wheat is sown. Sowing is carried out on fallow, using a slightly lower rate of wheat seed per acre and a normal dressing of superphosphate.

With most of the species tested, the use of a cover crop did not materially affect their establishment. Very little, if any, grazing can be expected from sown pastures in their first year, and the use of a cover crop is a means of reducing the cost of establishment. In addition to providing some return from the land during this period, the crop affords the young pasture plants some protection from drifting sand during the early stages of growth, and the stubble left after harvest, protects the plants during the critical summer months.

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Of the numerous species tested in the field those which show most promise under Mallee conditions are barrel medic, Wimmera rye-grass, and lucerne.

Barrel Medic (*Medicago tribuloides*), which is also known as barrel clover, has shown particular promise, and is the only one of the species sown in 1939 and 1940 that is still growing successfully in the field trials. Barrel clover should be of particular value in temporary pasture, for, being a legume, it assists in restoring soil fertility. Quite a number of local strains of barrel clover have been isolated, and these show considerable variation in type of growth, leafiness, and earliness.

To establish a balanced pasture, barrel clover and Wimmera rye-grass should be sown together. A suitable rate of seeding is 1 to 2 lb. of barrel clover and 2 to 4 lb. of Wimmera rye-grass. If no grass-seed attachment is available, the seed should be mixed with superphosphate, and sown at a shallower depth than normal. Such a pasture can be established on fallow with a cover crop of wheat.

Wimmera Rye-grass is a common species in many districts of Victoria, and in parts of the wheat belt it grows so profusely after cultivation that it is regarded as a weed. It has established itself naturally in many parts of the Mallee. It provides a good bulk of spring feed, but does not provide as much early feed as barley grass which is a nuisance in late spring because of its seed head. Wimmera rye-grass is stimulated by light cultivation, and it thins out in a paddock lying out to grazing for several years. It seems best as the component of a short-term pasture, and gives best results in this respect when sown with barrel clover. When fallowing a Wimmera rye-grass area, it may be necessary to give an extra working, or extra sheeping, to make a satisfactory fallow. Several strains have been tested at Walpeup, and the early-maturing strain, though less leafy, has given more feed than the later strains.

Lucerne has proved a very satisfactory plant when a reasonable establishment has been obtained. To get this establishment, average rains in the year that it is sown, and a good summer rain appear to be necessary.

A particularly good stand was obtained from the 1939 sowing, and for the three following seasons this lucerne area of 10 acres averaged a sheep per acre all the year for the three years. The stand persisted until 1944, but died out during the severe drought.

A seeding rate of 2 lb. per acre of lucerne with a cover crop on fallow, has proved the most satisfactory. The low rainfall conditions will not carry a heavy plant population, and, if there are too many plants, they will be stunted and not sufficiently deep-rooted to withstand a dry period.

The factors which limit the wider use of lucerne in the Mallee are the uncertainty of its establishment, and the need to graze the stubble leniently so as not to overgraze it in its first season.

New Pasture Establishment Trials

In 1946, a pasture establishment and persistence trial was commenced with a view to determining over a long period (a) the percentage of years and under what climatic conditions a satisfactory establishment of



Specimen plants of Barrel Medic growing at Walpeup.

pasture is possible; and (b) the persistence of such pastures under Mallee conditions.

The sites selected include a sandy ridge and a loamy flat. The plots on both of these soil types are sown with the following treatments each year:—

- (a) Wimmera rye-grass 2 lb. per acre and barrel clover 2 lb. per acre with a cover crop of wheat.
- (b) Lucerne 2 lb. per acre with a cover crop of wheat.
- (c) Wheat without pasture seed to be left out to natural pasture.

The plots are sown on fallow. The cover crop is sown with 40 lb. of seed and 90 lb. of superphosphate per acre.

Germination counts on the pasture are made in the first year to measure the original establishment, and, in subsequent years, population counts are made to ascertain the persistence of each species. The plots are grazed leniently in their first year to encourage the setting of seed, and observations are made on the development and spread of natural pasture species in these plots. Each year a strip down the centre of each plot sown is top-dressed with 45 lb. of superphosphate per acre.

In addition to the above, it is expected that this trial will provide useful information on the amount of fodder which can be expected from sown pastures in comparison with natural pastures.

Other Pasture Species

Of the other species, perennial or South African Veldt grass made fair growth in some years. It is a tussocky perennial palatable to stock, and spreads slowly by seed. The seed ripens unevenly, and commercial samples contain much inert matter. A strain recently obtained from South Australia—Unarlee strain—shows higher germinating ability. The rainfall at Walpeup is probably too low for the successful development of this plant, at least 14 inches being required for satisfactory growth.

CRESTED WHEAT GRASS is also a perennial grass that persisted fairly well. It is of more prostrate growth than perennial veldt grass and does not produce as much fodder as the veldt grass. As is the case with veldt grass it seems that the

rainfall is too low for this plant to be an economic possibility in the Mallee. It has been used to a large extent in stabilizing wind-eroded country in the Canadian prairies, but is unlikely to be successful for this purpose here.

BULBOUS BLUE GRASS has proved very drought resistant, but does not produce sufficient growth to warrant sowing it on a large scale.

TOOWOOMBA CANARY GRASS gave satisfactory germination on the area sown without cover crop, but practically no establishment where cover crop was sown. However, this plant has not given satisfactory growth under field conditions.

ARABIAN GRASS is a useful grass that has spread rapidly since its first appearance in the district about 1935. It does not supply a large bulk of feed, but it grows quickly after rain, and its seed head is not objectionable as is barley grass.

PERENNIAL WHEAT GRASS. Various selections of a type of perennial wheat grass have resulted from crossing, by a special technique, Ghurka wheat and Intermediate wheat grass. They are at present being developed and observed in preliminary trials to investigate their possibilities as pasture plants.

EVENING PRIMROSE has not given encouraging results at Walpeup, although this species does well on some of the light sands in areas with a little better rainfall. A good stand has been noted at Ngallo, south of Murrayville, where its growth is confined to the light sands. Although sown on the flats, it has not successfully established itself there.

BLUE LUPINS have not made satisfactory growth at Walpeup. Inoculation of the seed with bacteria has not resulted in increased growth. It is thought that the soils are too alkaline (limey) for the successful growth of this plant, which has proved of value in parts of Western Australia.

Satisfactory stands of BERRY SALTBUSH have been obtained from seed, but sheep do not eat this until the other plants in the area are eaten out.

SMALL HAIRY BURR MEDIC (*Medicago minima*) occurs naturally, and is spreading in the district. It has shown a good response to superphosphate in small topdressed plots. This medic does not

give the growth that barrel medic does, nor is it as palatable to sheep, and it has a very spiny burr that clings tenaciously to wool.

SNAIL CLOVER makes considerable growth, but does not recover after a grazing.

Owing to the importance of a pasture legume for Mallee districts, particular attention is being given to the medics, and at present, approximately one hundred strains of more than twenty medic species, including seed from many sources, are being tested.

There is great variation within some species, and barrel clover collected in northern and north-western Victoria shows great variation in leafiness, maturity, and type of burr. Some of the species obtained from overseas, e.g., *M. intertexta*, *M. murex*, and *M. obscura*, make very vigorous growth, and are being watched with interest.

SUBTERRANEAN CLOVER. The early strains of subterranean clover grow well in the first year when sown on fallow, but usually fail in the second year before seed is set.

SAND BINDING PLANTS. The search for an efficient, aggressive sandbinder is continuing, and a special plant nursery on a sandy site was established to test possible plants. Marram, kikuyu, pyp, and Giant Star grasses have not proved satisfactory for this purpose.

The most satisfactory plant to stabilize drifting sand is cereal rye.

SHEEP INVESTIGATIONS

Normally there are approximately 1,500,000 sheep in the Mallee before lambing commences in the autumn. Of these, approximately a million are breeding ewes, of which some 80 per cent. are mated to rams of British breeds, and the remainder to Merino, Corriedale, and Polwarth rams.



Medic rows in the pasture nursery, August, 1948.

Owing to the severe drought of 1943-45, sheep numbers were greatly reduced, and, at March, 1946, were less than half the normal number. Since then, flocks have again been built up, and, by March, 1948, the numbers had increased to 1,170,000, including 778,000 breeding ewes.

On some wheat farms, sheep are used primarily for controlling weeds on cultivated land, but, on most properties, they take a prominent place in the farming economy, justifying the increased attention now being given to their care and management as producers of lamb, mutton, and wool.

Fat Lambs

Although a lamb of any cross may be fattened fit for slaughter, the better types, for either local consumption or export, are usually sired by rams of British breeds, the most popular fat-lamb producers in the Mallee being the Border Leicester and Dorset Horn. The relative popularity of the various breeds of rams is set out in Table 30. This table is based on statistics issued annually by the Victorian Government Statist.

In the eastern Mallee, 93 per cent. of the rams used are of the mutton breeds, the Border Leicester (72 per cent.) being particularly popular in this section of the district. In the county of Karkaroo, the leading sires are the Border Leicester, 56 per cent.; Dorset Horn, 23 per cent.; and Corriedale, 10 per cent.; whilst in the

counties of Weeah and Millewa, the wool breeds are much more popular. In Weeah, 43 per cent. of the rams are of this type, while the proportion in the Millewa is 64 per cent. The Dorset Horn is the most popular mutton breed in these two counties.

TABLE 30.—PRINCIPAL BREEDS OF RAMS USED IN THE MALLEE.

Breed.	Percentage March, 1948.
Border Leicester	56
Dorset Horn	18.5
Corriedale	10
Merino	7
Romney Marsh	3
English Leicester	2
Southdown	1.5
Polwarth	0.5
Other breeds	2
Total number of rams used	14,369

The production of fat lambs is the first consideration of most sheep raisers in the Mallee. Nevertheless, as occurs elsewhere, some lambs are not sold as fats, but are disposed of as store lambs or carried over until the following year. The ewe weaners are potential mothers of future fat lambs, and are sought after by fat-lamb raisers, particularly in districts of heavier rainfall than the Mallee. The most popular fat-lamb mothers are crosses between Merino ewes and long-wool rams, although comeback types are preferred by some farmers.



Lambs at Mallee Research Station in July.

FAT LAMB INVESTIGATIONS

In 1939, an experiment was commenced at the Mallee Research Station, with the following objectives:—

- (a) To compare the suitability as mothers for lambs, both in the Mallee and in a "safe" district (Rutherglen), crossbred ewes obtained by mating Merino ewes with various breeds of rams.
- (b) To compare the various breeds of rams as sires for the production of fat lambs from Merino ewes.

In 1943, various feeding trials were commenced, and, in 1945, the breed tests at Walpeup were widened to compare two breeds of rams as sires for the production of fat lambs from strong comeback ewes.

Reports on these experiments are available in leaflet form, and will be posted free on application to the Manager, Mallee Research Station. The results of the investigations are summarized hereunder:—

The Production of Fat Lambs from Strong-Woolled Merino Ewes—Sire Trial

Strong-woolled Merino ewes are considered suitable for Mallee conditions because of their hardiness and their wool-growing capacity. They are less prone to stray than crossbred sheep, and the half-bred ewe progeny from a Merino ewe and a long-woolled ram is known to be a good carryover sheep if seasonal conditions do not allow it to be sold as a fat lamb.

In the trials commenced in 1939, a line of Merino ewes was divided each year into three even flocks which were then mated separately to Border Leicester, Dorset Horn, and Corriedale rams. Mating was commenced in mid-November each year and the rams were separated from the ewes during the autumn, winter, and early spring. If the rams run continuously with the ewes, lambing is usually later.



Border Leicester cross lambs bred from Merino ewes. The ewe portion of these lambs was retained and used in breeding experiments.

The lambing percentages obtained were satisfactory and were approximately equal for each of the three breeds for the period under investigation. In some years, the Border Leicester cross lambs were dropped later than those sired by the other two breeds.

Details of the breeding and the date of birth of each lamb were kept, and regular weighings were made during the growth of the lamb. The wether lambs were disposed of as fats when at suitable

weights and were appraised "over the hooks" at an export works. The ewe lambs were retained, some being used at this Station and the remainder sent to the Rutherglen Research Station for comparative testing there.

Early in the season the lambs sired by Border Leicester rams were lighter than those by Dorset Horn rams, but the Border Leicester cross lambs grew more rapidly later and were slightly heavier at the time of slaughter. The Dorset

TABLE 31.—FAT LAMB BREED TRIAL—COMPARATIVE LAMB RETURNS FROM MERINO EWES.
(Based on Actual Production over Four Years, 1940-43.)

						Breed of Ram Crossed with Merino Ewes.		
						Dorset Horn.	Border Leicester.	Corriedale.
						lb.	lb.	lb.
Average live weight at slaughter						76.4	76.4	71.2
Average frozen weight						34.1	34.2	29.6
Percentage first-grade carcasses						66.9	57.7	51.1
						£ s. d.	£ s. d.	£ s. d.
Average Lamb returns, 1945 export prices						0 18 8	0 18 8	0 16 3
						0 3 0	0 3 0	0 3 0
						1 1 8	1 1 8	0 19 3
Average Lamb returns, 1948 export prices						1 6 3	1 5 7	1 2 8
						0 6 3	0 7 0	0 6 0
						1 12 6	1 12 7	1 8 8



Left—Dorset Horn cross lambs from strong comeback ewes.

Lower—Border Leicester cross lambs from strong comeback ewes.



Horn cross produced 67 per cent. of first grade carcasses as against 58 per cent. from the Border Leicester cross and 51 per cent. from the Corriedale cross. There was no marked difference in the frozen weight to live-weight ratio between the Dorset Horn cross and the Border Leicester cross, but this ratio was lower in the Corriedale cross.

Taking the experiment as a whole over the four years there is little difference in the return per wether lamb from the Border Leicester or Dorset Horn ram when mated with the Merino ewe. Under the conditions of the experiment, which are typical of a large number of Mallee flocks, the quicker, earlier growth, and greater percentage of first-grade lambs sired by the Dorset Horn are made up for by the better late growth and extra weight of the Border

Leicester half-bred lambs. The Corriedale cross lambs were inferior to the British breed crosses. It is emphasized that this experiment and results are for mating with Merino ewes only.

Production of Fat Lambs from Comeback Ewes—Sire Trial No. 2

In 1946, a trial similar to the above was commenced, but strong comeback ewes were used instead of Merino. Dorset Horn

TABLE 32.—FAT LAMB BREED TRIAL—COMPARISONS OF LAMBS FROM STRONG COMEBACK EWES.

				Breed of Ram Used.			
				1946.		1947.	
				Dorset Horn.	Border Leicester.	Dorset Horn.	Border Leicester.
Average weight of lamb at birth	..	..	lbs.	11.7	11.5	11.0	10.0
Average live weight at slaughter	..	..	lbs.	82.3	76.7	83.5	78.7
Average frozen weight	..	..	lbs.	39.2	35.3	40.2	37.8
Percentage first-grade lambs	..	..	%	84.0	42.0	68.0	48.0
Average age at slaughter	..	..	days	112	107	141	136

and Border Leicester were the sires compared, and records similar to those recorded above were kept. Table 32 shows the average results obtained for the past two years, and indicates the superiority of the Dorset Horn ram as a sire of fat lambs for the early local market.

Although both groups were joined at the same time, lambs sired by the Border Leicester rams were dropped in 1946 about three weeks later, and in 1947 about five days later, than those sired by the Dorset Horns. In the former year, the lambs were treated in two lifts separated by three weeks, there being a much larger percentage of Dorset cross lambs in the first

were also of better quality, as shown by the percentage of first-grade lambs.

This trial is being continued this year, the early results confirming those of the two previous seasons.

Comparison of Half-bred Ewes as Fat-Lamb Mothers

Some of the ewe lambs dropped in the above Sire Trial were retained and when eighteen months old, along with a line of merino ewes of comparable age, were mated to Dorset Horn rams to give a comparison of the suitability of different breeds of ewes as mothers for fat lambs. Four lines, viz., Border Leicester x Merino, Dorset Horn x Merino, Corriedale x Merino, and Merino were thus tested.

The incidence of lambing in this trial was concentrated and early for all breeds (April-May). The Dorset Horn half-bred ewes were slightly more prolific than either of the other two crosses or merinos.

Lambs from the Border Leicester half-bred ewes had a greater birth-weight and generally gave a



lift. In the two years, the Border Leicester cross lambs were, on the average, five days younger at slaughter than the Dorset Horn lambs.

The Dorset Horn lambs grew slightly faster early in each year and then maintained this lead throughout the remainder of the season, being approximately 5 lb. live weight heavier at slaughter in both years. They



Types of ewes in the fat lamb trials at the Station.

higher dressed-weight and a higher percentage of first-grade carcasses than the lambs from other groups.

Table 33 shows the average results obtained for the six-year period 1942-47.

The value of the wool produced by the ewe is an important factor in determining the class of sheep kept, and the greater increase in the values of fine wools as compared with the coarser types in recent years has favoured the Merino and comeback type sheep. In this trial, complete records of the wool production (weight per head and value) of each ewe type has been kept for the life of the ewes.

During the period of the trial, there has been very little difference in the weight of wool cut from the merino and Corriedale x Merino ewes, and at present wool prices, such ewes are in keen demand.

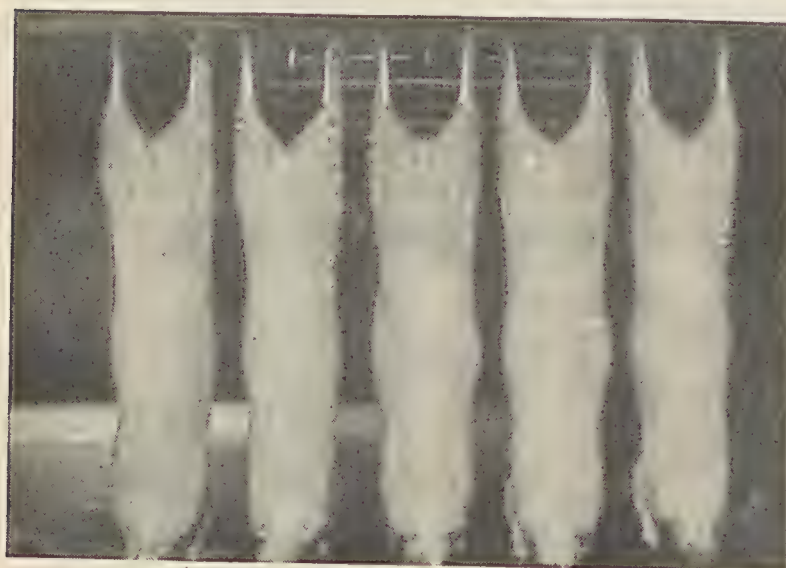
Another factor that may determine the type of ewe kept, or of ram used is that of earliness of lambs. Prices for sucker lambs in July and August are invariably above export parity, and the type of ewe that



An attractive pen of Dorset Horn cross lambs on the Mallee Research Station. Average weight 41·4 lb.

TABLE 33.—COMPARISONS OF MERINO AND HALF-BRED LAMBS FROM EWES.
(Average Six Years, 1942-47.)

Lambs.	Dressed Weight.	Per-centage First Grade.
	lb.	%
Dorset Horn x (Border Leicester x Merino)	38·5	77
Dorset Horn x (Dorset Horn x Merino)	36·2	74
Dorset Horn x (Corriedale x Merino)	33·4	59
Dorset Horn x Merino	32·7	45



First quality carcasses from the lambs illustrated above.

is capable of breeding early in the season may have an advantage. At the Mallee Research Station, no difficulty has been experienced in obtaining April early-May lambs by joining the ewes to Dorset Horn rams in mid-November, the majority of lambs being ready for market in August. Merino ewes tend to lamb earlier than most half-breds, which, however, produce quicker-growing and earlier-maturing lambs. Of the half-breds tested, the Dorset Horn-Merino cross ewes lambed the earliest.

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In most seasons, the Dorset Horn sires were more active than the Border Leicesters and obtained earlier lambs.

An additional factor determining the type of ram used is the value, in the following autumn or winter, of lambs carried over from the previous spring, and which could not be disposed of as suckers then. Observations on the ewe portion of the lambs by Border Leicester, Dorset Horn, and Corriedale rams from strong-woolled merino ewes showed that the Border Leicester half-bred lambs developed into the biggest-framed sheep in the following winter, and that the greatest weight of wool was cut from the comeback (Corriedale x Merino) ewe. The average weight of wool cut from the various types of 2-tooths in 1941 and 1942 was Corriedale x Merino, 10·1 lb.; Border Leicester x Merino, 9·2 lb.; and Dorset Horn x Merino, 8·4 lb. The Dorset Horn cross is thus at a disadvantage in this respect.

AGGREGATE RETURNS—WOOL AND LAMBS—LAMB-MOTHER TRIAL

The lambs from the investigations at the Mallee Research Station have been treated "over the hooks", and their weights

and grades obtained. From these figures, returns at any particular price schedule can be ascertained.

Table 35 sets out the aggregate returns for lambs, skins, and wool from the different types of ewes and their lambs. Prices used in the calculation of export lamb returns in this table (and Table 31) are given in Table 34. Wool prices for 1945 are based on appraisalment returns, and, in 1947-48, the average of seven sales throughout the selling season was used.

TABLE 34.—EXPORT LAMB PRICE SCHEDULES,
1945 AND 1948.

Weight and Grade.		Weight Range.	1945.	1948.
		lb.	d.	d.
First quality	{ D ..	20-28	7	10 ¹ / ₁₆
	{ 2 ..	29-36	6 ⁷ / ₈	9 ⁹ / ₁₆
	{ 8 ..	37-42	6 ¹³ / ₁₆	9 ⁵ / ₁₆
	{ 4 ..	43-50	6 ³ / ₈	8 ⁹ / ₁₆
	{ T ..	51-56	5 ¹ / ₂	6 ³ / ₈
Second quality	{ D ..	20-28	6 ⁹ / ₁₆	9 ¹ / ₁₆
	{ 2 ..	29-36	6 ¹ / ₂	8 ³ / ₄
	{ 8 ..	37-42	6 ¹ / ₁₆	8
	{ 4 ..	43-50	5 ³ / ₈	7 ¹ / ₂
Third quality	{ L ..	20-28	6 ¹ / ₂	8 ¹ / ₁₆
	{ O ..	29-50	5 ³ / ₈	8 ¹ / ₄



Shorn ewe weaners, 6 months old. Corriedale x Merino (left), Dorset Horn x Merino (centre), and Border Leicester x Merino (right).

The results of the ewe-comparison investigations at the Mallee Research Station may be summarized as follows:—

A. On 1945 Prices for Wool and Frozen Lamb

In this year, differences between the wool values of the different ewe types were not great, and the value of the lamb was the prime factor in determining relative financial returns. Under prices such as these, the Border Leicester x Merino half-bred ewe gave the highest returns.

B. On 1947-48 Prices for Wool and 1947 Prices for Frozen Lamb

As indicated in the discussion above, in the last wool season (1947-48) the rise in price of the finer and comeback types of wool has been greater than that of the half-bred types. The section of the table in which these prices are used shows that, while the greatest lamb returns have been obtained from the Border Leicester x Merino half-bred, the wool returns from the Corriedale x Merino and strong-woolled Merino

have been sufficient to counter-balance this, enabling these types of ewes to give slightly better financial returns than the half-bred ewes.

C. On 1948 Lamb Prices—Newmarket (Mid-August); 1947-1948 Prices for Wool

In this section of the table, the wool values used are the same as in B, i.e., those of 1947-48. The prices for the lambs are based on Newmarket values (less commission) as at the middle of August, 1948. They were taken as 11d. per lb. for light lambs, up to and including 42 lb., and 9½d. per lb. for heavy lambs, over 42 lb. On this basis, the meat returns per ewe are higher than in B above, but the relative positions of the types used are the same; that is, despite the greater value of the lamb from the Border Leicester half-bred, the wool return from the Merino and comeback types has been such that these types of sheep gave the greatest financial return.

TABLE 35.—COMPARATIVE RETURNS FROM EWES MATED TO DORSET HORN RAMS.
(Based on Actual Production over Six Years, 1942-47.)

Class of Ewe.	Wool from Ewe.		Average Return from Lambs, all Sired by Dorset Horn Rams.				Gross Return from Ewe.
	Wool Weight.	Value.	Frozen Weight.	Carcass Value.	Skin Value.	Lamb Value.	
	lb.	£ s. d.	lb.	£ s. d.	s. d.	£ s. d.	£ s. d.
A. 1945 PRICE LEVELS.							
Border Leicester x Merino ..	7.5	0 8 10	38.5	1 0 11	3 0	1 3 11	1 8 0
Dorset Horn x Merino ..	6.8	0 7 9	36.2	1 0 0	3 0	1 3 0	1 6 2
Corriedale x Merino ..	9.0	0 10 6	33.4	0 18 4	3 0	1 1 4	1 6 6
Merino ..	8.9	0 9 4	32.7	0 17 10	3 0	1 0 10	1 4 11
B. 1947-48 WOOL PRICES, 1948-49 EXPORT PRICES.							
Border Leicester x Merino ..	7.5	1 0 4	38.5	1 8 8	7 6	1 16 2	2 9 3
Dorset Horn x Merino ..	6.8	1 1 0	36.2	1 7 7	7 0	1 14 7	2 8 8
Corriedale x Merino ..	9.0	1 8 10	33.4	1 5 9	7 3	1 13 0	2 13 7
Merino ..	8.9	1 10 4	32.7	1 4 9	7 0	1 11 9	2 14 2
C. 1947-48 WOOL PRICES, LAMB PRICES, NEWMARKET, MID-AUGUST, 1948.							
			Chilled Weight lb.				
Border Leicester x Merino ..	7.5	1 0 4	39.7	1 14 7	7 6	2 2 1	2 13 11
Dorset Horn x Merino ..	6.8	1 1 0	37.3	1 13 6	5 11	1 19 5	2 12 6
Corriedale x Merino ..	9.0	1 8 10	34.4	1 11 3	7 7	1 18 10	2 17 11
Merino ..	8.9	1 10 4	33.7	1 10 9	6 10	1 17 7	2 18 6

Drought Feeding of Sheep

A trial was commenced during 1943-44 to study the effect of supplementary feeding of ewes and their lambs in the autumn and winter. The year proved to be a drought, and handfeeding was continued until the lambs were disposed of. Three hundred and fifteen sheep were carried at two different stocking rates—3 sheep to 4 acres (heavy stocking), and 3 sheep to 8 acres (light stocking). Wheat alone was fed to those in the lighter stocking group, while the other group was fed chaff in addition to the wheat when paddock roughage was exhausted. Serious mortality due to pregnancy toxæmia in the heavier stocked group indicated that it is necessary to start supplementary feeding in time to prevent serious loss of condition.

Briefly, the information gained shows that handfeeding for lengthy periods when little paddock feed is available is not justified, unless cost of replacement of the ewes is considered, but that if some roughage is still left in the paddocks, supplementary feeding will give satisfactory results, and lambs marketable as fats can be produced by supplementary feeding with wheat under such conditions.

After a severe drought it may be virtually impossible to purchase sheep, and this factor must be given due consideration in assessing the economics of handfeeding.

In November, 1944, paddock feed was very short, and it was then obvious that handfeeding of some description would be necessary for at least three or four months.

It was, therefore, decided to handfeed 100 breeding ewes on wheat alone until there was sufficient paddock feed for them. These sheep were placed in a small bare paddock in mid-November, and kept there for eight months, by which time the green feed commenced to show after the June rains. For the whole of this period, wheat was fed at the rate of nine-tenths of a pound per day. The ewes lost some weight, but they lambed satisfactorily, 81 lambs being dropped, of which 51 survived, finally being sold as trade lambs at the average price of 19s. 6d. each. Seventy-five of the

original 100 ewes were shorn in September, cutting 6·8 lb. of wool per head, appraised at 7s. per fleece.

The actual cost of the wheat fed to the ewes was £65, which works out at the high rate of 17s. 4d. per head on the 75 which survived. High as this figure is, it is less than the value of the lambs and wool produced, and in addition there remained 75 ewes worth at least £100, compared with the 100 ewes, which, if not fed, would have had to be sacrificed for approximately £50.

The reason for the more favorable financial result in this trial, as compared to the 1943-44 trial was that good spring growth enabled lambs to be fattened and sold on natural feed in 1945, while, in 1944, handfeeding had to be continued until the lambs were disposed of or weaned. In the earlier year, the lambs were not fit for slaughter, and were only valued as stores.

During the period of handfeeding many enquiries were received concerning the advisability of crushing wheat instead of feeding it whole. Fifty dry sheep were divided by alternate drafting into two groups, and then run under similar conditions in a 20-acre paddock which was subdivided into two sections. The two groups were fed similar amounts of grain—one group whole grain (wheat), and the other crushed wheat, for three months. At the end of that time, there was less than half a pound difference in the average weight of the two groups. Thus no advantage due to the crushing could be demonstrated, and the cost of crushing (about 1s. per bag) is an additional factor that must be given consideration. Also, when wheat is crushed, it is essential that sufficient troughing is available for feeding the wheat in, whereas whole wheat can be fed on hard ground if troughs are not available.

From other trials during the drought, information was obtained regarding the suitability of various types of fodder for drought feeding. It was also shown that carry-over lambs could be fattened on grains and disposed of in the following autumn, and that grain feeding during

(continued on page 561.)

IN THE ORCHARD

By G. W. Gayford, B.Agr.Sc., Senior Horticultural Instructor

THE PEAR AND CHERRY SLUG

THE pear and cherry slug is the larva of a small inconspicuous wasp which lays its eggs on the leaves of fruit trees, and, from these eggs, the small, black, slimy slugs hatch out.

The slugs feed on the upper surface of leaves of pears, cherries, quinces, and plums. Only the surface leaf tissue is eaten, a skeleton of veins remaining, and, in cases of severe infestation, a tree may lose a considerable portion of its leaf area. The leaves are a food-producing portion of the plant, and, when extensive damage has been done to them, the tree's ability to produce a satisfactory crop in the following season is impaired.

On commercial orchards where insecticides are applied as a routine against the codling moth, pears and quinces are not normally affected by the slug. However in some years, commercial cherry and plum orchards are damaged fairly extensively by this insect.

Fortunately, the pest may be readily controlled by sprays of lead arsenate, 2 lb. powder per 100 gallons water, or DDT (0.1 per cent.). It is recommended that cherries and plums be sprayed as soon as live insects are noticed after the crop has been picked.

RED SCALE NEEDS EARLY TREATMENT

The high red scale population of 1947 has been reduced on citrus trees in the Mildura area, but there is still sufficient evidence of this pest to indicate that thorough control is again necessary in the present season.

The adult scales adhere to mature fruit, and rather drastic treatment with high-pressure water jets is necessary to remove the scales and make the fruit fit for marketing. Even though the scale may have been killed by spraying or fumigation, the fruit will require treatment for scale removal and this has the effect of increasing the susceptibility of the fruit to mould.



Quince leaf damaged by Pear and Cherry Slug.

Reduction of the scale population to almost negligible proportions at this time of the year by fumigation or spraying, will ensure clean fruit for next harvest season. Fumigation may be commenced as soon as possible after petal fall. If it is not possible to fumigate in December, it is suggested that an oil spray, using white oil emulsion at the rate of 1 gallon in 40 of water, should be applied immediately, and this may be followed in January or February by fumigation.

In districts where fumigation is used, a spray of white oil emulsion at the rate of 1 gallon in 40 of water should be applied immediately, and this may be followed in January or February by fumigation.

In districts where fumigation is not used, a spray of white oil emulsion may be applied in February or March. Where severe infestation exists, two sprays at intervals of four to eight weeks are recommended.

SUMMER CONTROL OF RED SPIDER AND BRYOBIA MITE

Red Spider and Bryobia mite have increased over the past few years, particularly on apple and pear orchards sprayed with

DDT. The new insecticide, HETP, applied at the rate of 1 pint in 300 gallons of water, is effective against the adult stage of these pests but does not kill the eggs.

Two sprays should be applied, the first when mites are in large numbers on the leaves, and a second spray about ten days later to kill mites which have hatched out in the intervening period. HETP is an unstable material when diluted, and it is essential that it should be applied to the trees as soon as possible after it is added to the spray vat. In spraying the trees, a point to be remembered is that most of the mites congregate on the under surface of the leaves and care should be taken to obtain a thorough spray coverage of the whole leaf surface.

PASSION FRUIT SPRAYING AND PRUNING

In a season such as the present, which is favorable to fungous diseases, brown spot may cause trouble in passion-fruit plantations. For control it is necessary to spray with Bordeaux mixture—strength 6 : 4 : 80.

Pruning of the vines will assist in the control of this disease, and the best time for this operation would be during the early spring before new growth commences.

Many of the older vines contain tangled masses of dead wood which make thorough spraying difficult, and these types of vines should be considerably thinned out to allow efficient spraying and also to improve ventilation of the vine.

CARE OF YOUNG FRUIT TREES

The climate of Victoria is characterized by dry periods during the months from January to March. Young fruit trees usually start the season's growth in soil which is well supplied with moisture, and consequently, good growth can be expected for the first month or two. It is important, however, that young trees should be given every opportunity to make strong growth during their early years, and, if dry conditions occur during the summer, hand watering is advisable.

In citrus districts the periods between normal irrigations may be too long for new trees with a limited root system and hand watering is just as important as on non-irrigated properties. Although clean cultivation may not be required over the whole of a newly-planted area, it is advisable to keep a circle of about 2 yards diameter around each tree, free of all weed growth during the summer.

PASTURE AND SHEEP INVESTIGATIONS *(continued from page 559)*

the drought yielded more satisfactory results if commenced before the ewes became too low in condition.

The 1943-44 trials showed that hand-feeding under heavy stocking conditions left the soil in a condition very liable to wind erosion. It is suggested, therefore, that before a paddock becomes too bare in a drought, sheep be excluded from it, and if there is no roughage on any paddock, that the sheep be kept in a relatively small area of heavier land, preferably protected by some timber. Sheep will then not waste energy walking over large areas and paddocks are not continually stirred up by the sheep wandering over them.

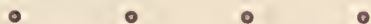
VISITORS AND INSPECTIONS

The Mallee Research Station is open to inspection at any time on week days, and visitors are welcome. Discussions on agricultural and pastoral matters between farmers and the staff of the Station assist the Department in planning its experimental work, and help the producer to appreciate the value of the investigations already carried out.

Farmers' field days are held regularly, but arrangements for visitors to be conducted over the Station at other times may be made with the Manager, Mr. J. M. McCann. (Telephone, Walpeup 2D.)

THE FLOWER GARDEN

By T. H. Kneen, B.Agr.Sc., Principal, School of Primary Agriculture and Horticulture, Burnley Gardens



POPULAR BULBS AND ROOTS

EARLY in the New Year home gardeners will be giving consideration to the planting of many spring-flowering bulbs, such as narcissus, hyacinth, tulip, grape hyacinth, babiana, anemone, and ranunculus.

The term "bulbs" covers a good deal more than the correct botanical meaning of the word, so that we shall not confine our discussion to the true bulbs.

The bulb of the daffodil is a true bulb and consists of a series of fleshy bulb scales, enclosing a complete new plant. This will emerge after planting, drawing on the reserves of food and energy contained in the bulb scales. These scales are really the swollen bases of foliage leaves which have died down to the top of the bulb.

Many plants possess underground stems which store food and these are variously classified as rhizomes, tubers, and corms. Rhizomes are thick, fleshy, creeping stems usually found underground. Many species of iris show typical rhizomes.

In the gladiolus, which is a true corm, a sectional view of the corm reveals a marked difference between its structure and that of the daffodil. The corm is solid and packed with food material. In this case the lower part of the stem has swollen to provide a food storage organ.

NARCISSUS

Narcissus is one of the most popular of all bulbs. The number of species, some 20 to 30, is not very large, but a huge number of horticultural varieties derive largely from five or six species. These include the Polyanthus (many-flowered)



Narcissus, and the Jonquil, as well as the common daffodil, the petticoat daffodil, and the poet's narcissus.

An old classification divided them into three main groups based on the relative dimensions of the central cup or crown. This simple classification proved inadequate, and was displaced by one which provides eleven divisions, many of which are further sub-divided.

In the first division are the trumpet daffodils, those which possess a "trumpet or crown as long as, or longer than, the perianth segments". (There are six perianth segments in narcissus, arranged symmetrically around the central axis.) In the first sub-division of this division are found the yellow trumpet daffodils which are generally the largest of all the Narcissus family. King Alfred is a well-known variety in this sub-division. Others are Ptolemy and Emperor.

In the second sub-division of the trumpet daffodils are included varieties in which both trumpet and perianth are white. Peter Barr is a good example of this type. In the third sub-division fall the bi-colour varieties, i.e., those having a white or whitish perianth and a trumpet coloured yellow, lemon, or primrose. The variety, Empress, is an example of this class.

(continued on page 565.)

THE VEGETABLE GARDEN

By George Hyam, Horticultural Supervisor

PRUNING AND POLLINATING CUCURBITS

TO justify the space vine vegetables occupy in small areas, it is necessary to induce as many flowers to set fruit as possible by hand pollination rather than leave this to chance visits by insects. A heavy setting results in the production of many small to medium-sized fruits, rather than the fewer oversized pumpkins, marrows, or melons which are not so convenient for household use.

The area the plants occupy can be lessened by pruning and training, and by a judicious nipping back of the main runners. This stimulates the growth of laterals upon which most of the female fruiting flowers are borne.

Pruning consists of nipping off the growing tips of the runners at a convenient length, usually about 4 feet, and the removal of any weak lateral growth that is not flowering. Runners can be left to grow longer and be kept in bounds by bending them in a circular direction round the main crowns. They may be kept in this form by means of small stakes inserted in the soil around the vine at intervals of about 2 feet.

Vine vegetables produce male and female flowers, the latter being easily recognized by a small swelling at the base of the petals which is the embryo fruit. This fruit will not develop until pollinated from the male flowers. It is an easy matter to ensure that each fruit is pollinated by picking a mature male flower and stripping the petals so as to expose the pollen-bearing stamen in the centre. By touching the stigma or centre portion of the female flowers with the stamen, pollination is effected. Each male flower carries enough pollen for several female flowers.

This work of pollination is best done in the early morning when the petals of the female flower are wide open, but it can be carried out later in the day if the operator can recognize maturity in closed female flowers.

Pumpkins, squash, marrows, and melons can all be made to yield more in this way, but it is not so necessary for cucumbers which will set edible fruit without pollination. If seed is required, however, it is as well to hand-pollinate some of their fruits.



Hand-pollinating cucurbit flower. Remove petals from male flower, and brush the pollen on to the female flower. This is best done in the early morning when the petals are open.

CUCUMBERS AND GHERKINS

The pickling form of cucumber, of which the immature fruits are the gherkins of commerce, can be recommended for the home garden. The larger fruits are quite suitable for salads and the vines occupy less space than the other vine vegetables.

The seed can be sown this month, three seeds to a hill. Under garden conditions the hills are spaced 3 to 4 feet apart.

The soil need not be made so rich as for other cucurbits, but some organic manure should be worked in the soil together with 1 oz. of blood and bone to each hill.

For pickling gherkins, the fruits are picked about 48 hours after setting, and, when this is done, the plants yield very heavily. If fruits are allowed to run to full maturity, the formation of later fruits is retarded.

Pickling cucumbers are fruits which are about half-grown, and fruits of this size make a choice salad. Pending pickling, gherkins and cucumbers can be stored in brine made from $\frac{1}{2}$ lb. of salt to 1 gallon of water, preferably in a wooden or pottery vessel.

In the garden, room for a few plants can often be found along the edges of raised beds and paths or some other odd corner, but they should not be planted in shade. Suitable dual-purpose varieties are Chicago Pickling and Boston Pickling.

SUMMER TREATMENT OF TOMATOES

Early-planted tomatoes are now growing vigorously and are apt to get out of control unless pruned. Under home garden conditions staking is recommended, even for the bush types like Tatura Globe, Tatinter, or Burwood, though these need little, if any, pruning except to keep them more or less compact.



Method of pruning tomatoes.

Pruning consists of pinching out the laterals and retaining 1, 2, or 3 leaders. "A" denotes where the lateral growths should be pinched out and "B" the flower "sets" or fruit. When the plant reaches the top of the stake, pruning can be discontinued.—If early varieties are grown and early fruit is required, the top of the plant should be pinched back about the height of the top of the stake.

Most other varieties should be provided with 6-ft. stakes and kept from one to three stems by pruning. This consists in nipping out the shoots which appear at the junction of the leaves and main stems. Leave the growths that are formed on the main stems between the leaves as these are the flower and fruit clusters. Side shoots develop very rapidly in summer, so the plants should be gone over two or three times a week during the full flush of growth. The unwanted shoots should not be allowed to develop to any length.



Method of tying a tomato plant to the stake. The knot should be at the back of the stake.

The retained stems should be firmly tied to the stakes with a figure 8 knot so as to allow for the expansion of the stem during growth. Except for the leaves growing between the first fruit cluster and the ground all other foliage should be retained, otherwise the ripening fruit may be sun-scalded.

The appearance of the first flowers indicates the time when the first side-dressing of fertilizer may be given. Apply about a teaspoonful of 5 : 1 : 1 superphosphate, ammonia, and potash round each plant, but not too close to the stem. Tomatoes at this stage will need abundant watering, and the plants should be regularly dusted about every three weeks with one of the special tomato dusts. Any diseased plants are best removed and destroyed rather than left to possibly affect others.

The use of hormone sprays with the idea of setting early fruits has been disappointing, and, in many cases, has resulted in



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FIRST STAGE



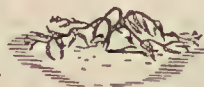
The weed absorbs "Methoxone" which causes a serious physiological disturbance owing to the high concentration of the hormone in the plant.

SECOND STAGE



The stems thicken and leaves become twisted and contorted.

THIRD STAGE



The foliage changes colour and the weed dies. Meanwhile, cereal crops also sprayed are completely unharmed.

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HORSHAM and QUANTONG—Permewan, Wright Ltd., Tel. Horsham 17; Hardinge Bros. Pty. Ltd., Tel. Horsham 542; Quantong Fruit Growers Assn., Tel. Horsham 59.

INGLEWOOD—R. & T. Jennings. Tel. 1.

KYABRAM—Permewan, Wright Ltd. Tel. 98.

MILDURA—Dixon's Mildura Markets Pty. Ltd. Tel. 162.

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distortion of fruit and foliage. The drop of early flowers can be the result of too-early planting, bad weather, or insect attack, but, if watering and pest control are attended to, the normal drop is of little significance.

Keep weed growth down, but do not hoe too closely to the plants or too deeply. When cultivating, draw the soil slightly towards the plants. Mulching round the plants is desirable to conserve moisture and keep the surface soil cooler.

OTHER DECEMBER PLANTINGS

All summer vegetables can be sown or planted during this month for later successions; a late planting of tomatoes should be made to produce fruit in autumn when early plants will be exhausted.

The seed of cabbage, cauliflower, and Brussels sprouts can be sown to produce seedlings for February-March planting.

Water should be withheld from onions which have reached to full-size bulbing stage, as well as from garlic and shallots which are reaching maturity at the end of the month.

In all but the northern areas, main crops of carrots, parsnips, and beetroot can still be sown.

If red spider, green vegetable bug, or harlequin bug appear on any crop, dust or spray with compounds containing DDT and gammexane. DDT is not effective on red spider, but gammexane will control them. Overseas reports suggest that cucurbits can be damaged by DDT, so, if pumpkin beetle appears it would be as well to use arsenate of lead instead. Combined DDT and gammexane dusts are now largely used by commercial growers against cabbage grubs and aphids.



THE FLOWER GARDEN (continued from page 562)

The second division is known as the *Incomparabilis Narcissus*, distinguished by the cup or crown measuring from one-third to nearly the length of the perianth segments. The cups are richly coloured, much shorter than the preceding class, and contrasting with the usually pale perianth. Sir Watkin (yellow) and Bernardino (bi-colour) are representative varieties of this class.

In the third division, *Narcissus Barrii*, the cup is even shorter—less than one-third the length of the perianth segments. As in the preceding class, there are yellow

shades with or without red colouring on the cup, or bi-colour varieties, with white or whitish perianth and self-yellow, red-stained, or red cup. *Barrii* *Conspicuous*, quite an old variety, is a good example in this class.

The foregoing divisions, together with *Leedsii*, the fourth division, cover most of the narcissus seen on the show bench. The *Leedsii* *Narcissus* is distinguished by the white perianth and cup or crown which may also be cream or pale citron, sometimes tinged with pink or apricot—example, *Nightlight*.

LOWER LEAF SCORCH OF FLAX

By C. R. Millikan, M.Agr.Sc., Senior Plant Pathologist

The first portion of this paper appeared in our November issue

POT AND FIELD EXPERIMENTS

Pot and field experiments have been conducted during the years 1945 to 1948 inclusive to determine the effects of applications of lime, sulphur, and various minerals, notably manganese and molybdenum, to the soil, on the incidence of lower leaf scorch in flax grown therein. The effects on the disease of soil sterilization, to which reference is made in the survey of the literature above, has also been studied.

(a) Pot Experiments

In 1945 and 1947 soil (surface 6 inches) for these experiments was obtained from areas on which flax showed severe symptoms of lower leaf scorch. The localities were Gisborne, Westmere, and Lake Bolac respectively. In 1946, however, the soil was obtained from areas in the above localities which were either in the virgin state, or had not been cropped for approximately fifteen to twenty years.

The soil was placed in glazed earthenware pots 9 inches in diameter and 11 inches deep, and the actual treatments studied in the various experiments are set out in Tables 1 to 6 inclusive. The sulphur and lime treatments were mixed with all the soil in appropriate pots at least six weeks before sowing. For soil sterilization studies the soil was autoclaved at 14 lb. pressure for three-quarters of an hour, and was sown the next day. Mineral treatments were applied in a horizontal plane immediately prior to sowing. The lowest dressing of ammonium molybdate by itself was applied in solution in distilled water.

To ensure satisfactory plant emergence, about $\frac{1}{2}$ inch of soil was placed on top of the applied chemical before the seed was sown. The variety used was Liral Crown or Concurrent, and there were either three or four replicates of each treatment. Soon after emergence the plants were thinned out to 100 per pot.

(b) Field Experiments

Two types of field experiments were employed, namely, hand-sown rows and drill-sown experiments on farmers' crops.

Hand-sown Rows

These rows were sown in 1945 and 1946 on areas which, in the previous season, had produced flax which had shown severe lower leaf scorch.

Each experiment consisted of rows 30 links long with 2 links between rows. The actual treatments studied are shown in Tables 1 and 4, each being replicated four times in randomized blocks. The sulphur and lime treatments were mixed with the soil in the appropriate rows approximately five to six weeks before sowing.

All quantities of fertilizers, minerals, &c., were calculated on the basis of a row 7 inches wide.

To prevent any harmful effects on plant emergence, the treatments other than superphosphate were placed in the bottom of a furrow approximately $2\frac{1}{2}$ inches deep which was then partly filled in before the seed was sown.

The variety used was Concurrent, and a known weight of seed (6.5 grams) was sown per row.



Fig. 3.—Experiment with Gisborne soil 1945, showing the marked growth response to superphosphate 5 cwt./ac. This treatment entirely prevented the development of Lower Leaf Scorch, whereas the disease was prevalent in the untreated plants.

At the appropriate time, samples consisting of all the plants in one half of each row were pulled and bagged, and were examined immediately in the laboratory, and the percentage of plants in each sample showing lower leaf scorch was determined.

Drill Sown Experiments

In 1947–48 several areas on which farmers intended to sow flax were selected because of their high acidity and the presence of large amounts of decaying sod in the soil. At sowing individual drill widths in these areas were treated with ammonium molybdate at the rate of approximately $\frac{3}{4}$ lb. per acre in addition to the normal dressing of superphosphate. The molybdenum treated drill widths in each crop amounted to approximately $\frac{1}{2}$ acre in area. In 1948, two replicated field experiments were sown. The area of each individual plot was approximately $\frac{1}{30}$ th acre.

Samples of plants from both pot and field experiments were submitted to the Agricultural Research Chemist, State Laboratories, for analyses for the constituents indicated in the various Tables below.

Results

In general it was found that, where the soil involved in the experiment had grown an affected flax crop in the previous year, considerably less lower leaf scorch developed in these experiments, than occurred in the previous crop in the same soil. This drop in the incidence of the disease in the second crop is in accord with other field experience.

The first crop would remove only a slight amount of manganese, and other elements from the soil solution. The improvement in the second crop could be attributed to (a) leaching; (b) the elimination of the reserve of active organic matter, with the result that less bivalent manganese was produced by the reduction of the insoluble higher oxides of manganese in

the soil (Leeper 1947). This aspect is discussed in the review of literature.

The results of the various pot and field experiments are set out in Tables 1 to 6 inclusive. The effects of the various treatments studied in these experiments are summarized below.

Superphosphate

Very marked growth responses to superphosphate dressings usually, but not always, occurred in the various experiments (see Figs. 2 and 3 and Table 4), and significant reductions in the amount of lower leaf scorch were recorded in the plants so treated, when compared with the untreated controls.

The above result confirmed an observation made on replicated flax manurial plots at Strathkellar in October, 1944, to the effect that plants in all plots receiving superphosphate 1 cwt. per acre were almost entirely free of lower leaf scorch, whereas the plants in each untreated plot were very dwarfed, slightly chlorotic, and practically 100 per cent. affected with the disease.

A similar striking effect occurred in a flax crop at Gisborne in 1947. Here the superphosphate supply to one hoe of a sixteen-hoe drill used to sow the crop was cut off due to a broken manure star. Later all the plants growing in this particular row without superphosphate in each drill width throughout the whole area of the crop (some 20 acres in all), were stunted, markedly chlorotic and very severely affected with lower leaf scorch, whereas the plants

in the remaining rows which received superphosphate showed a much smaller percentage of lower leaf scorch (Fig. 2). In this particular crop a portion of the area was treated at sowing time with sodium molybdate 1 oz. per acre mixed with the superphosphate. On the portion so treated the percentage of plants showing lower leaf scorch symptoms was appreciably less than the remainder of the area which received superphosphate only.

It appeared that some factor other than a simple phosphate deficiency was responsible for the poor growth of flax, in the absence of superphosphate applications, in the Victorian soils concerned. This conclusion was suggested by the very significant fact that the superphosphate treated plants in the various experiments (and also in the two instances quoted above at Strathkellar and Gisborne respectively) were usually much darker green in colour than the untreated plants. The significance of this darker-green colour of the superphosphate treated

plants is discussed in the review of the literature above.

From this discussion it is evident that, although the superphosphate treatments significantly reduced the number of plants affected with lower leaf scorch, this disease was not due to a deficiency of phosphorus in the untreated plants. Also, the analyses set out in Table 1 reveal that the superphosphate treated plants may actually contain a lower phosphoric acid (P_2O_5) concentration than untreated plants, although the total amount present in the treated plants may well be greater. A consistently higher phosphoric acid (P_2O_5) concentration in diseased plants is also shown in the analyses of field-grown samples presented in Table 7.

Samples of the superphosphates used in the 1946 and 1947 experiments respectively were submitted to the Agricultural Research Chemist for molybdenum determinations. The results of these analyses are shown in Table 2.

TABLE 1.—RESULTS OF POT AND FIELD TESTS WITH GISBORNE SOIL 1945, SHOWING THE EFFECTS OF TREATMENTS ON THE INCIDENCE OF LOWER LEAF SCORCH, AND ON THE MINERAL COMPOSITION (ON DRY BASIS) OF FLAX PLANTS SAMPLED ELEVEN WEEKS (POT TEST) AND SIXTEEN WEEKS (FIELD TEST No. 2) RESPECTIVELY, AFTER GERMINATION.

Treatment per Acre.	Pot Test.				Field Test No. 1.	Field Test No. 2.				
	pH of Soil.	Lower Leaf Scorch.	Phosphoric Acid.	Zinc.	Lower Leaf Scorch.	Lower Leaf Scorch.	Zinc (Zn).	Manganese (Mn).	Iron (Fe).	Aluminium (Al).
		%*	%	p.p.m.	%	%*	p.p.m.	p.p.m.	p.p.m.	p.p.m.
Untreated	5.20	40	1.10	77	4.4	..	..	..	..	..
Superphosphate 2 cwt.	..	0	0.51	37	0.0	0	81	37	216	162
Superphosphate 5 cwt.	..	0	0.79	71	0.2	..	..	..	..	..
Zinc sulphate 2 cwt.	5.26	60	0.97	298	17.8	..	..	..	..	..
Superphosphate 5 cwt. + zinc sulphate 2 cwt.	..	40	0.83	256	12.9	..	..	..	..	..
Sulphur 1 ton †	4.22	100	0.62	49	12.4	85	75	95	606	296
Lime 4 tons †	7.60	0	1.00	22	0.0	0	56	46	313	223
Sulphate of ammonia 2 cwt. ..	..	..	..	..	4.5	..	..	..	..	..
Sulphate of potash 2 cwt. ..	..	..	..	..	5.8	..	..	..	..	..
Magnesium sulphate 2 cwt. ..	..	..	..	..	9.4	..	..	..	..	..
Manganese sulphate 2 cwt. ..	..	..	..	..	12.4	..	..	..	..	..
Difference for significance ..	..	..	..	..	1% 11.8 5% 8.8	..	..	..	..	..

* Estimated.

† In field test No. 2 superphosphate 2 cwt./ac. was applied in conjunction with these treatments.

TABLE 2.—MOLYBDENUM CONTENTS OF SUPERPHOSPHATES USED IN POT AND FIELD EXPERIMENTS IN 1946 AND 1947, AND IN INDIVIDUAL FARMERS' TESTS IN 1947.

Sample.	Molybdenum.
	Parts per million.
1. Used in 1946 Pot and Field Experiments *	25
2. Used in 1947 Pot Experiments * ..	13
3. F. E. Doery, Streatham † ..	13
4. W. F. A'B. Weigall, Gisborne † ..	11
5. D. A. Holdsworth, Westmere ..	12
6. F. Meagher, Strathkellar ..	59
7. P. Fry, Strathkellar ..	39
8. H. Brewis, Strathkellar ..	16

* The use of these samples caused significant reductions in the percentage of lower leaf scorch (see Tables 4 and 5).

† Applications of ammonium molybdate reduced the incidence of lower leaf scorch in these farmers' tests. The disease did not occur in the remaining farmers' crops.

From these results, and the effects of molybdenum treatments described hereunder, it is apparent that the very significant reductions in the severity of lower leaf scorch which were induced by superphosphate were due to the presence of appreciable amounts of molybdenum impurity. The marked growth responses to superphosphate described above were doubtless due to a phosphate-molybdenum interaction (Anderson and Oertel, 1946). In

this regard it is significant to note that, where the growth response to superphosphate was relatively small, this treatment was also not so effective in eliminating lower leaf scorch.

In certain experiments the addition of superphosphate to highly acid soils treated with very heavy dressings of manganese sulphate (5 to 10 cwts. per acre) caused significant increases in the percentage of plants showing lower leaf scorch symptoms at all levels of ammonium molybdate application (see Table 5). In this regard, it has been demonstrated in water cultures (Millikan 1948) that increased phosphate increased the severity of manganese toxicity symptoms in flax.

From the above apparently conflicting results of experiments with superphosphate, it appears evident that two opposing factors were operating, viz., the effects of the molybdenum impurity in the superphosphate in reducing, and of phosphate in increasing, the severity of manganese toxicity symptoms. At the lowest levels of soluble manganese in these experiments (i.e., in the soil not treated with manganese sulphate) the molybdenum effect was evidently sufficient to overcome the phosphate effect. However, when the already high concentration of soluble manganese in the soil was considerably increased by heavy applications of manganese sulphate, even heavy applications of molybdenum in the absence of superphosphate did not entirely prevent the development of manganese toxicity symptoms. Under these conditions, when a further small supply of molybdenum was obviously immaterial, the phosphate effect in increasing the severity of lower leaf scorch became apparent.

Manganese Sulphate

Very significant increases in the amount of lower leaf scorch in both pot and field tests with highly-acid soils resulted from manganese sulphate applications (Figs. 4 and 5). The plants were usually only slightly chlorotic, although individual plants

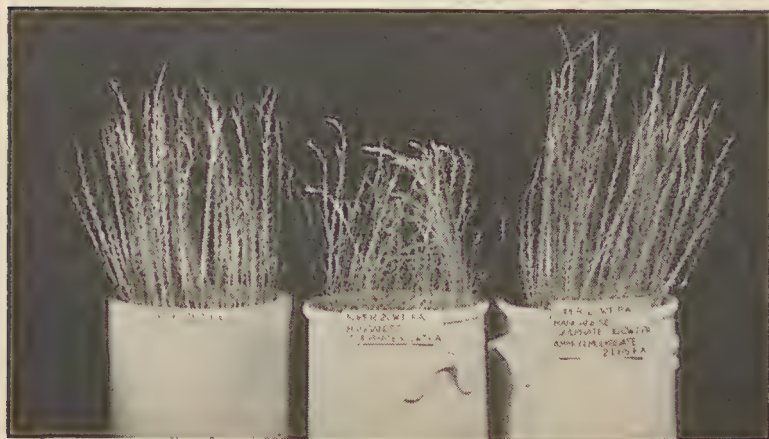


Fig. 4.—Portion of pot test No. 3 with Gisborne soil (pH 4.8) during 1947 (see Table 5), showing the effect of molybdenum in preventing severe injury resulting from the application of an excessive amount of manganese sulphate. A high percentage of the flax plants receiving the heavy manganese dressing without molybdenum (centre) showed severe Lower Leaf Scorch symptoms (see Fig. 5). These symptoms were much less severe in the plants in the other two pots.

showing very marked chlorosis of the youngest leaves occurred, particularly at the higher levels of manganese sulphate application. This chlorosis was due to manganese induced iron deficiency. In water cultures lower leaf necrosis was most prevalent at concentrations of 50 p.p.m. or more of manganese (Millikan 1948). At these concentrations lower leaf necrosis was always accompanied by severe iron deficiency chlorosis and necrosis of the top of the plant unless additional iron was supplied to the solution. The fact, therefore, that flax plants treated with heavy dressings of manganese sulphate in the pot and field experiments with highly acid soils often showed lower leaf necrosis accompanied by only slight iron deficiency chlorosis indicates that the soils concerned normally contained adequate amounts of available iron.

In pot experiments conducted during the summer months in particular, manganese sulphate also caused a lower leaf "spotting" (see Fig. 6) identical in appearance to that produced in water cultures with excess manganese (Millikan 1948). The affected leaves later died, giving the plants an appearance similar to those affected with typical lower leaf scorch.



Fig. 5.—Close-up view of centre pot shown in Fig. 4 showing severe Lower Leaf Scorch in flax induced by a heavy application of manganese sulphate to Gisborne soil.

TABLE 3.—RESULTS OF POT TESTS DURING EARLY SUMMER 1945 WITH LAKE BOLAC (PH 4.7) AND WESTMERE (PH 4.8) SOILS, AND DURING WINTER 1947 WITH WESTMERE SOIL (TEST No. 2) SHOWING THE EFFECTS OF TREATMENTS ON THE INCIDENCE OF TYPICAL LOWER LEAF SCORCH, AND TOTAL LEAF SYMPTOMS (INCLUDING LOWER LEAF SCORCH AND LEAF "SPOTTING") RESPECTIVELY, AND ON THE CHEMICAL COMPOSITION (IN PARTS PER MILLION ON DRY BASIS) OF FLAX PLANTS SAMPLED SEVEN WEEKS AFTER EMERGENCE.

Treatment.*	Lake Bolac Soil.						Westmere Soil.						
							Test No. 1.						Test No. 2.
	Lower Leaf Scorch.	Total Leaf Symptoms.†	Zinc (Zn).	Manganese (Mn).	Iron (Fe).	Aluminium (Al).	Lower Leaf Scorch.	Total Leaf Symptoms.†	Zinc (Zn).	Manganese (Mn).	Iron (Fe).	Aluminium (Al).	Lower Leaf Scorch.
	%	%	p.p.m.	p.p.m.	p.p.m.	p.p.m.	%	%	p.p.m.	p.p.m.	p.p.m.	p.p.m.	%
Untreated	2.8	5.3	87	231	459	576	0.8	1.8	46	153	198	113	0.3
Zn 1	4.8	11.2	..	..	..	..	13.9	27.3	..	..	..	..	..
Zn 1 Mn 1	..	..	..	..	..	..	21.4	45.5	..	..	..	..	..
Steam sterilized	21.4	75.8	78	572	2,302	863	16.7	31.8	78	395	300	176	98.7
Steam sterilized M ₂ 20.. .. .	..	..	..	..	..	..	..	..	..	..	..	..	90.5
Steam sterilized P ₂	..	..	..	..	..	..	..	..	..	..	..	..	100.0
Steam sterilized P ₂ M ₂ 20	..	..	..	..	..	..	..	..	..	..	..	..	100.0
Difference for significance—													
1 per cent. level	8.0	15.5	..	..	..	..	8.4	23.4	..	..	..	..	5.0
5 per cent. level	5.5	10.8	..	..	..	..	6.1	17.0	..	..	..	..	3.28

* Zn 1=Zinc sulphate 1 cwt./ac. Mn 1=Manganese sulphate 1 cwt./ac. P 2=Superphosphate 2 cwt./ac. M₂20=Ammonium molybdate 20 lb./ac.

† Total symptoms includes plants showing typical lower leaf scorch or leaf "spotting".



Fig. 6.—Necrotic spotting of the lower leaves produced by a heavy dressing of manganese sulphate (10 cwt. per acre) in a pot experiment with Westmere soil (pH 4.9) conducted during mid-summer.

By contrast to the above recorded effects on flax of heavy dressings of manganese to highly acid soils, an application of 10 cwt. per acre of manganese sulphate to a "healthy" soil (pH 5.8) from Lismore, caused no noticeable injury to flax. This suggests that rapid fixation of manganese took place in this soil due to the microbial oxidation of the bivalent ions to insoluble higher oxides. Such an oxidation in the soil can take place at or above pH 5.5 (Leeper and Swaby 1940).

From the results in Tables 1, 3, and 7, it will be seen that manganese is the only constituent determined whose concentrations in the plants can be correlated in all instances (except one shown in Table 7) with the lower leaf scorch status of the plants. This further confirms the relation of manganese toxicity to the incidence of lower leaf scorch, as shown above by the highly significant effect of manganese sulphate dressings in increasing the severity of the disease in flax grown in highly acid soils.

Water culture experiments have shown that oats are much more tolerant to an excess of manganese in the substrate than is flax. Whereas flax growing in a nutrient solution containing 100 parts per million of manganese were dwarfed and showed iron deficiency chlorosis and lower leaf scorch, oat plants growing in the same pot were

apparently unaffected (Fig. 8). This tolerance of oats for excess manganese is doubtless the reason why they make prolific growth in the field on highly acid soils on which flax shows severe symptoms of lower leaf scorch.

Molybdenum

Sodium molybdate 1 cwt/acre or ammonium molybdate 2, 20, or 56 lb/acre respectively caused large and significant reductions in the percentages of plants showing lower leaf scorch symptoms (Tables 4, 5, and 6, Fig. 4). The severity of symptoms in individual affected plants was also reduced by molybdenum. These

reductions occurred when the molybdenum was either applied alone or with superphosphate, and/or heavy dressings of manganese sulphate. It was evident that the molybdenum had an important effect in "detoxifying" the effects of excessive manganese. This confirmed the existence of a manganese-molybdenum antagonism in the plant as demonstrated in water culture experiments (Millikan 1947c, Fig. 7).

The molybdenum-treated plants were usually a darker green colour than the untreated plants. In some instances the plants receiving superphosphate alone were also darker green than the untreated control plants. This colour was attributable to the presence of significant amounts of molybdenum impurity in these particular samples of superphosphate, as indicated above.

Treatment per Acre.*	Streatham.†	Gisborne.†	Strathkellar.‡	
			Test 1.	Test 2.
	Lower Leaf Scorch.			
	%	%	%	%
P. ..	25.0	13.7	45.9	26.9
P + Mo	0.0	0.9	0.0	0.0

* P = Superphosphate. Mo = Ammonium molybdate.
Rate of application:—Streatham, Strathkellar, ‡ lb./ac.;
Gisborne, 1 oz./ac.
† Conducted during 1947. ‡ Conducted during 1948.

Observational experiments on two commercial flax crops during 1947-48 confirmed the effect of molybdenum applications in reducing the incidence of lower-leaf scorch. The results of counts for lower-leaf scorch (means of 50, 1-ft. random samples) are shown in the preceding table.

Samples of plants affected with lower leaf scorch, and of healthy plants from both the superphosphate alone, and superphosphate plus ammonium-molybdate treated areas in the Streatham crop were submitted to the Agricultural Research Chemist for analysis, the results of which (on dry basis) are shown in the table at right.

	Affected Plants Superphosphate only.	Healthy Plants Superphosphate only.	Healthy Plants Superphosphate + Ammonium Molybdate.
Dry weight per 100 plants (grams) ..	% 1.35	% 3.55	% 3.53
Manganese (Mn) p.p.m.	815	627	710
Molybdenum (Mo) p.p.m.	15	22	34
Zinc (Zn) p.p.m. ..	84	131	125
Mn/Mo ratio	54.4	28.5	20.9

The plant samples were obtained on 4th September, 1947, the plants then being approximately eight weeks old.

TABLE 4.—RESULTS OF POT AND FIELD TESTS DURING 1946, WITH LAKE BOLAC, GISBORNE AND WESTMERE SOILS RESPECTIVELY. SHOWING THE EFFECT OF VARIOUS TREATMENTS ON THE PERCENTAGES OF FLAX PLANTS SHOWING LOWER LEAF SCORCH SYMPTOMS.

Treatment per Acre.†	Lake Bolac Soil.*	Gisborne Soil.*				Westmere Soil.*	
	Pot Test.	Pot Test.	Field Test.		Field Test.		
	Lower Leaf Scorch.	Lower Leaf Scorch.	Lower Leaf Scorch.	Dry Weight per 100 Plants.	Lower Leaf Scorch.	Dry Weight per 100 Plants.	
	%	%	%	grams.	%	grams.	
Untreated	65.8	36.8	4.8	6.0	8.4	11.2	
P ₂	37.4	29.0	2.2	11.3	6.1	28.1	
P ₅	..	..	1.2	15.2	2.5	50.7	
S ₂₀	100.0	100.0	..	..	..	..	
S ₄₀	..	..	26.9	4.6	23.9	8.7	
S ₄₀ P ₂	..	..	30.5	6.3	23.2	18.0	
Ca ₂₀	6.4	5.8	..	..	..	..	
Ca ₄₀	..	..	0.9	6.1	1.3	8.2	
Ca ₄₀ P ₂	..	..	0.3	8.6	1.9	16.9	
Mn ₄	100.0	64.3	24.1	4.5	36.0	10.1	
Mn ₈	100.0	93.5	33.2	5.4	33.8	6.2	
Mn ₈ P ₂	100.0	57.1	12.3	7.8	44.7	7.0	
Zn ₂	93.8	53.8	21.5	4.4	22.2	7.7	
Zn ₅	100.0	74.6	31.2	4.3	24.4	7.1	
Zn ₅ P ₂	100.0	74.4	26.6	4.8	32.5	9.6	
Al ₈	..	35.2	14.4	4.6	7.7	8.2	
Al ₈ P ₂	..	..	12.5	5.8	11.7	6.5	
Fe ₅	..	..	5.7	4.9	6.6	10.2	
Mo ₁	1.0	0.0	..	..	..	..	
Steam sterilized	100.0	..	..	..	..	..	
Difference for significance —							
1 per cent. level ..	8.4	8.4	14.4	1.9	12.4	6.0	
5 per cent. level ..	6.3	6.3	10.7	1.4	9.3	4.5	

* The reactions of the soils were:—Lake Bolac pH 4.9; Gisborne pH 4.8; Westmere pH 4.8.

† P=Superphosphate; S=Sulphur; Ca=Lime; Mn=Manganese sulphate; Zn=Zinc sulphate; Al=Aluminium sulphate; Fe=Ferric citrate; Mo=Sodium molybdate. The figures with each treatment represent cwt. per acre.

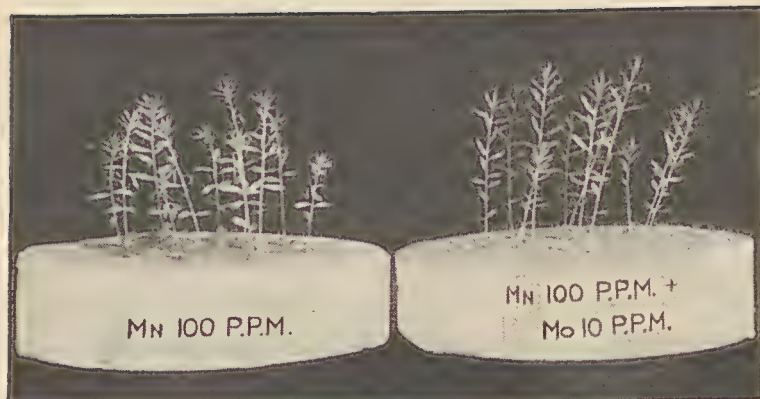


Fig. 7.—Water culture experiment showing the effect of molybdenum in preventing the development of manganese induced Lower Leaf Scorch resulting from an excess of this element in the solution (After Millikan 1947c).

Features of these results are the high manganese concentration of all plants, but of the affected plants in particular, the increase in the molybdenum status following the application of ammonium molybdate, and the lower Mn/Mo ratio in the healthy plants than in those affected with lower leaf scorch.

Under the extremely acid soil conditions caused by a heavy application of sulphur to an already highly acid soil, or,

TABLE 5.—RESULTS OF POT EXPERIMENTS DURING THE TWO SEASONS 1946-47, USING GISBORNE, WESTMERE, AND LAKE BOLAC SOILS, SHOWING THE EFFECTS OF SUPERPHOSPHATE, MANGANESE SULPHATE, AND AMMONIUM MOLYBDATE APPLICATIONS, RESPECTIVELY, ON THE INCIDENCE OF LOWER LEAF SCORCH SYMPTOMS IN FLAX.

Treatment.*	Gisborne Soils.				Lake Bolac Soil.	Westmere Soils.	
	Test No. 1.	Test No. 2.	Test No. 3.			Test No. 1.	Test No. 2.
			%	Severity Index.			
Nil	56.5	5.2	29.3	14.2	0.0	0.3	17.4
Mo ₂	3.6	0.0	0.0	0.0	0.0	0.0	0.0
Mo ₂₀	..	0.0	0.0	0.0	..	0.0	..
Mo ₅₆	1.6	..	0.0	0.0	0.0	..	..
P ₂	11.1	0.3	14.3	7.3	0.0	0.0	0.0
P ₂ Mo ₂	4.4	0.0	0.0	0.0	0.0	0.0	..
P ₂ Mo ₂₀	..	0.0	0.0	0.0	..	0.0	..
P ₂ Mo ₅₆	2.8	..	0.0	0.0	0.0	..	..
Mn ₅	..	..	54.4	23.3	1.5	..	..
Mn ₅ Mo ₂	..	..	5.3	1.7	..	..	..
Mn ₅ Mo ₂₀	..	..	3.2	1.2	..	..	..
Mn ₅ Mo ₅₆	..	..	1.3	0.5	0.0	..	..
Mn ₁₀	..	..	65.7	52.3	6.5	..	..
Mn ₁₀ Mo ₂	..	..	19.5	5.4	..	..	..
Mn ₁₀ Mo ₂₀	..	..	16.7	5.2	..	..	..
Mn ₁₀ Mo ₅₆	..	..	22.6	6.0	0.3	..	..
P ₂ Mn ₅	40.2	38.7	70.6	33.8	2.3	14.1	..
P ₂ Mn ₅ Mo ₂	..	..	10.3	3.1	..	..	..
P ₂ Mn ₅ Mo ₂₀	..	0.6	7.1	1.7	..	3.7	..
P ₂ Mn ₅ Mo ₅₆	13.0	..	13.6	3.4	0.0	..	..
P ₂ Mn ₁₀	58.2	..	83.0	48.5	13.1	..	84.9
P ₂ Mn ₁₀ Mo ₂	..	..	36.5	10.7	..	..	58.1
P ₂ Mn ₁₀ Mo ₂₀	..	..	32.0	10.5	..	..	..
P ₂ Mn ₁₀ Mo ₅₆	13.1	..	34.9	13.6	2.8	..	..
Difference for significance—							
1 per cent. level	9.3	8.0	14.6	6.1	2.8	4.3	20.8
5 per cent. level	6.8	5.8	10.9	4.6	2.1	3.1	12.5

* P₂=Superphosphate 2 cwt./ac.; Mo₂, 20, 56=Ammonium molybdate 2, 20, and 56 lb./ac.; Mn₅, 10=Manganese sulphate 5 and 10 cwt./ac.

Reactions of soils=Gisborne pH 4.8-5.0, Lake Bolac pH 4.7, Westmere pH 4.7.

alternatively, in sterilized soil, molybdenum was found to be ineffective in preventing very severe lower leaf scorch (Tables 3 and 6). This ineffectiveness was attributed to the unavailability of applied molybdenum at the very low soil pH and/or excessive uptake of manganese by the plant.

TABLE 5A.—EFFECTS OF MOLYBDENUM AND LIME APPLICATIONS ON THE INCIDENCE OF LOWER LEAF SCORCH IN REPLICATED DRILL-SOWN EXPERIMENTS AT LAKE BOLAC AND WESTMERE DURING 1948.

Treatment per Acre.	Lake Bolac.	Westmere.
	Lower Leaf Scorch.	
	%	%
Untreated	..	24.0
Superphosphate * 1 cwt.	12.6	22.9
Superphosphate 1 cwt. + Ammonium molybdate 1 lb. ..	0.0	0.1
Superphosphate 1 cwt. + lime 2 cwt. ..	11.2	..
Superphosphate 1 cwt. + lime 5 cwt. ..	8.5	..
Superphosphate 1 cwt. + lime 40 cwt.	0.7	..
Superphosphate 1 cwt. + lime 2 cwt. + ammonium molybdate 1 lb.	0.0	..
Difference for significance—		
1 per cent. level	6.6	6.2
5 per cent. level	4.4	3.7

* The molybdenum (Mo) contents of the superphosphate used were :—Lake Bolac, 1 p.p.m. ; Westmere, 2 p.p.m.

Zinc Sulphate

Heavy applications of zinc sulphate had very severe effects on root development. Plant stand was considerably reduced due to rotting of the radicles. In water cultures, zinc has been shown to be much more toxic than manganese to flax root development (Millikan 1948).

Zinc sulphate dressings induced significant increases in the severity of lower leaf scorch (see Tables 1, 3, and 4). The zinc-treated plants also showed slight to severe iron deficiency chlorosis (Millikan 1947A). However, in one instance (in Table 3), zinc sulphate had no effect on lower leaf scorch symptoms.

The leaf "spotting" symptoms referred to in Table 3 appeared to be similar to those produced in water cultures by the addition of excess zinc (Millikan 1947A, 1948). The symptoms consisted of numerous small

necrotic spots, which occurred on any part of the leaf, but which were usually largest on the edges. The incidence of these spots appears to be related in some way with the occurrence of hot weather.

The analyses shown in Tables 1, 3, and 7 indicate that the incidence of lower leaf scorch and leaf "spotting" symptoms cannot be correlated in every instance with the results of zinc determinations made on the samples from the various treatments.

It was concluded, therefore, that zinc toxicity was not a contributory factor to the occurrence of lower leaf scorch or leaf "spotting" symptoms in the untreated plants or those subjected to treatments other than zinc sulphate.

Sulphur

Soil treatment with sulphur was found to greatly increase the percentage of plants affected with lower leaf scorch (Tables 1, 4, and 6). The treated plants also showed slight to marked chlorosis. This effect was primarily the result of the increased soil acidity induced by this treatment, which in turn increased the availability of the soil manganese as evidenced by the increased concentration of manganese in the plants even after sixteen weeks (Table 1).

These results are in accord with the literature citations above on the effects of increasing soil acidity on manganese and molybdenum availability. Molybdenum applications were ineffective in preventing severe lower leaf scorch in the sulphured soil (Table 6).

It is of interest to record that in the 1946 field experiments (see Table 4) the flax plants subjected to the treatment sulphur 40 cwt., plus superphosphate 2 cwt./ac. were observed to be very much more susceptible to frost injury than those of any other treatment.

Lime

Applications of lime greatly reduced the incidence of lower leaf scorch in flax grown in soil so treated (Tables 1, 4, and 5A). This effect was associated with a decrease in the zinc concentration in the plants. From the literature citations given above it is obvious that liming would also decrease the availability of manganese and increase the availability of molybdenum in the soil.



Fig. 8.—Water culture experiment with oats (var. Algeribee) and Flax (var. Liral Crown) grown in the same containers, showing the much greater tolerance of oats compared with flax, for an excess of manganese in the nutrient solution.

Steam Sterilization

Sterilization of either Lake Balac or Westmere soils by steam resulted in very significant increases in the percentages of plants showing either lower leaf scorch or leaf "spotting" symptoms (Tables 3 and 4). The latter symptoms were most evident in experiments conducted during summer. Many plants also showed marked chlorosis of the youngest leaves in conjunction with the above symptoms. These symptoms were identical in appearance with those produced in plants grown in unsterilized soil treated with heavy dressings of manganese sulphate.

The analyses shown in Table 3 confirm that the plant symptoms resulting from steam sterilization, were in fact associated with a very appreciable increase in the manganese concentration compared with that in plants grown in unsterilized soil, whereas the effects of soil sterilization on the zinc concentration of the plants was not consistent. It was evident that the natural concentration of available manganese in the Lake Bolac and Westmere soils was high, and that the effect of steam sterilization was to increase it to the point where it became toxic to the plants grown in the soil so treated.

TABLE 6.—POT EXPERIMENT WITH WESTMERE SOIL 1947, SHOWING THE EFFECT OF A HEAVY APPLICATION OF SULPHUR TO THE SOIL IN GREATLY INCREASING THE PERCENTAGE OF FLAX PLANTS SHOWING LOWER LEAF SCORCH, AND THE INEFFECTIVENESS OF DRESSINGS OF AMMONIUM MOLYBDATE IN PREVENTING THE ULTIMATE DEVELOPMENT OF VERY SEVERE LOWER LEAF SCORCH SYMPTOMS IN FLAX GROWN IN THE SULPHURED SOIL.

Treatment.*	Time after Emergence.†	
	Three Weeks.	Six Weeks.
	%	%
Nil	0.3	0.3
S ₂₀	50.0	99.0
S ₂₀ Mo ₂ ..	12.3	96.6
S ₂₀ Mo ₂₀ ..	18.7	93.3
S ₂₀ P ₂	42.9	98.5
S ₂₀ P ₂ Mo ₂ ..	15.8	97.4
S ₂₀ P ₂ Mo ₂₀ ..	20.4	98.0
S ₂₀ P ₂ Mn ₅ ..	57.5	100.0
S ₂₀ P ₂ Mn ₅ Mo ₂₀ ..	33.8	100.0
Difference for significance—		
1 per cent. level ..	12.7	4.4
5 per cent. level ..	9.2	3.2

NOTE.—Reaction of soil. Normal pH 4.7. Sulphured pH 3.3.

* S₂₀=Sulphur 20 cwt./ac. mixed four weeks before sowing with all soil in the pot; Mo₂, 20=Ammonium molybdate 2, 20 lb./ac.; P₂=Superphosphate 2 cwt./ac.; Mn₅=Manganese sulphate 5 cwt./ac.

† At eight weeks after emergence 100 per cent. of plants in all pots of sulphured soil showed severe lower leaf scorch symptoms.

The iron deficiency chlorosis of the plants occurred in spite of the fact that soil sterilization greatly increased their iron concentration. This indicates that in this instance not iron absorption but its utilization in the tissues of the plant was adversely affected by an excessive absorption of manganese. This aspect of the toxic effects of heavy metals has been discussed by Millikan (1947A, 1947B, 1947C).

By way of contrast with the above result Kipps (1947) reports that, although steam sterilization caused a four-fold increase in manganese in bean plants, there was no corresponding increase in total iron.

Ferric Citrate

A dressing of 5 cwt. of Ferric citrate per acre had no effect on the lower leaf scorch status of the plants (Table 4). The treated flax plants were dark green in colour: Millikan (1948) has described the symptoms of iron toxicity in flax.

Other Treatments

The following had no effect on the incidence of lower leaf scorch:—Aluminium sulphate (Table 4); Magnesium sulphate; sulphate of ammonia; and sulphate of potash (Table 1).

Conclusion

It is concluded from the above results of pot and field experiments, that lower leaf scorch disease of flax is primarily due to the combined effects of manganese toxicity and molybdenum deficiency, both of which are induced by highly acid soil conditions. The existence of a molybdenum-manganese antagonism in the plant is confirmed. Increasing the acidity of the soil with sulphur aggravates lower leaf scorch, while decreasing the acidity with lime alleviates the disease.

A further instalment of this paper will appear in a subsequent issue of the Journal.

Bots in Horses

The damage caused by the bot fly includes worry to the horse while the fly is laying its eggs, and damage to the lining of the stomach by the larvae. However, death seldom results from infestation.

The bot fly attaches its eggs to the hairs, mainly of the forelegs, and under the throat or chin or on the lips. The eggs hatch and the young larvae find their way into the mouth where they burrow in the lining of the cheeks and under the tongue. From here they make their way to the stomach. After a period of up to twelve months in the stomach, the fully grown bot larvae pass out with the faeces to the ground. Here they burrow in, and pupate for two to five weeks before emerging as adult bot flies ready to lay eggs.

To combat the fly, every effort should be made to remove the eggs from the horse's coat by grooming regularly and rubbing with a cloth soaked in a 2 per cent. solution of carbolic dip or lysol. It may even be necessary to clip the horse.

After the egg-laying season is finished in the autumn, bots in the stomach may be removed by giving a ball containing carbon bisulphide. The dose for a horse of about 1,000 lb. weight is 6 drachms, administered in a gelatine capsule, or proportionately less for smaller horses. Give bran mash for two days and starve overnight before treatment, but on no account should a purgative be administered either before or after treatment. Take care not to break the capsule during administration, because the drug is dangerous if breathed into the lungs.

[Contributed by the Live Stock Division.]



